DIABETIC CARE
IN
PICTURES

Simplified Statements with Illustrations
Prepared for the Use of the Patient

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To Our Son John—

For Considerable Patience

Throughout This Preparation

PREFACE

The third edition of Diabetic Care in Pictures has been fully revised and contains up-to-date information on the advancements made concerning diabetes and its treatment The chief intention of the authors in this book, as with its two preceding editions, is to furnish the patient with sufficient knowledge of the subject to allow him to understand the significance of sharing the responsibility for the achievement of successful treatment So much depends upon complete co-operation between the patient and the physician As the user of this book will see, treatment is a determined program with each part involving patient participation and perseverance

Diabetic Care in Pictures is concerned with the diet the various kinds of insulin, its measurement and the technic of injection insulin reactions diabetic acidosis and coma, tests of blood and urine hygiene and the care of the body especially the feet, present day opinions concerning personal and social factors, including marriage and pregnancy The new edition also answers the patients questions on the latest oral drugs used for the treatment of diabetes

The diet for diabetes is discussed in detail with particular attention given to the queries of the patient The food exchange lists with illustrations are presented, and the reader will be especially interested in the new section on special dishes for restaurant eating Diabetic diets which have been adjusted for other conditions are now included—sodium restricted diets, the bland diet, the low residue diet and the liquid diet

Insulin preparations in current use are featured, together with the latest equipment for their injection In addition to the standard tests for determining the presence of sugar, acetone and diacetic acid in the urine, there now are presented, with illustrations, the newer simplified tests for these determinations

Much of the visual presentation in this book was conceived in 1918 when Frances Stern, the founder of the first food clinic in the world, initiated and developed the then new, and now accepted, concepts in visual education Through her foresight the tremendous educational value of visual aids was realized Today, the methods and the materials developed in the Frances Stern Food Clinic are being used throughout the world

The wide acceptance of the first two editions of Diabetic Care in Pictures by patients and professional workers in the field of medicine and public health has been most gratifying and has prompted this revision It is believed that the information presented will serve the needs of the reader as has been our experience with patients in private practice and in the Diabetes Clinic of the Boston Dispensary

We wish to express our thanks to those who have aided in the preparation of this edition the patients who have proved the value of the teaching methods through constant and successful use of the first two editions, Mrs Pearl C Baker, former Associate

in the Frances Stern Food Clinic, for her keen interest and particular care in the selection and the arrangement of material, especially where diet and food values are concerned, Mrs Clare Simmons Wood, for her efforts in preparing the drawings, Peter H Tarter, for his help in assembling and editing the manuscript, Miss Clare Forbes, Chief of the Frances Stern Food Clinic, for her care in proofreading the sections on diet, Burroughs Wellcome for their interest and assistance, Eli Lilly Company for continued interest and assistance in this edition, Ames Company for their aid and the J B Lippincott Company, especially J Brooks Stewart and Stanley A Gillet, *for their encouragement and ready assistance at all times*

HELEN AND JOSEPH ROSENTHAL

CONTENTS

TO THE PATIENT

This book tells the story of diabetes and its treatment The knowledge supplied will be a means of helping you to share with the physician the responsibility for the control of the disease Constant use of the information in these pages should remove anxiety or fear and give you a feeling of security Treatment will then become a routine part of your daily living, and you will be able to live a normal, happy life

1. DIABETES* AND ITS TREATMENT

DIABETES* is not uncommon and occurs universally. Recent statistics indicate that there are more than one and a half million people in the United States known to have diabetes, with probably as many more people with undetected diabetes.

When the body is not able to use and store food in a normal fashion, diabetes follows. The cause of this condition is due either to an insufficient supply of insulin or to interference with the action of insulin in the body. For many years it was thought that the pancreas, from which insulin is derived, was the only gland related to diabetes. However, recent investigations have shown that other glands may be involved as well, and conditions associated with these glands may require treatment.

Insulin is a hormone normally manufactured in the body by the pancreas, a gland located just below and behind the stomach (Fig. 1). Within the pancreas are special clusters of cells called islands of Langerhans.† Certain cells, namely, Beta cells, within the islands of Langerhans, supply insulin which is released from the pancreas into the blood stream as it is needed for the proper use and storage of sugar which is derived from food.

The diagnosis of diabetes can be confirmed by definite laboratory tests of the blood and the urine. Although the exact nature of the cause of diabetes is not yet fully understood, recent years of research have yielded much knowledge concerning this disease and its treatment. While it must be stated that diabetes cannot be cured as of the present time, current investigations point to promising possibilities in the future.

NORMAL USE AND STORAGE OF FOOD IN THE BODY

The many body functions and processes are regulated with astonishing detail of accuracy, and this holds true for the metabolism of sugar in the body. Normally, insulin supplies are adequate, and the body can use and store as much sugar as is derived from the food in the diet. The sugar is obtained not only from all of the carbohydrate in food (p. 10) but from approximately 60% of the protein in the diet (p. 10), and from about 10% of the fat in the diet (p. 10).

In the normal processes of digestion the sugar derived from food is converted in the intestines into glucose. Then the glucose is taken up from

* Diabetes mellitus, the full name for this condition, is derived from Greek words meaning flowing through (diabetes) and honey or sweets (mellitus).

† Named after the German scientist Langerhans, who first called attention to these cells.

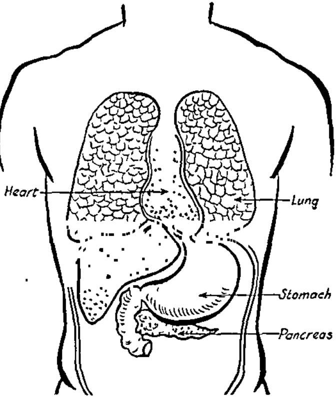


FIG 1 Diagram showing position of pancreas in the body.

the intestinal tract by the blood stream and carried to the liver where it is changed into still another form of sugar called glycogen This glycogen is stored in the liver, the muscles and in other body tissues to become available whenever there is a demand for energy As the need occurs, the glycogen is then reconverted into glucose, since it is in this form that sugars are utilized by the body

Normally, with adequate amounts of available insulin, there is a wonderful balance maintained within the body in regard to the utilization of sugar. When more food is furnished by the diet than is required for immediate use, this excess food is stored as available sugar, or it can be converted into fat and stored throughout the body as fat deposits Sugar is carried to the various parts of the body through the blood stream; therefore, a certain amount of sugar is present in the blood at all times to be used by the body for food and energy However, when all the processes of nor

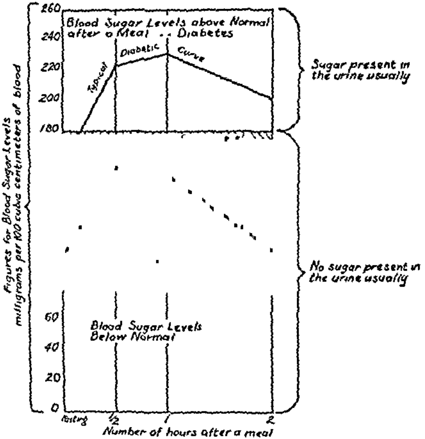


Fig 2 Normal and diabetic blood sugar levels

the amounts of sugar in the blood (blood sugar-levels) remain within normal limits and no sugar is present in the urine at any time (Fig 2)

DIABETES AND CARBOHYDRATE (SUGAR) METABOLISM

The normal use and storage of sugar does not take place when diabetes is present because there is insufficient insulin for sugar metabolism Instead the sugar derived from food accumulates in the blood stream causing blood sugar levels to rise beyond normal limits (Fig 2) After certain limits have been reached then sugar is "spilled over" from the kidneys into the urine

The signs and symptoms commonly associated with diabetes are directly

related to these increased amounts of sugar in the blood stream and to the presence of sugar in the urine.

SIGNS AND SYMPTOMS OF DIABETES

As previously stated, diabetes is usually recognized by the presence of sugar in the urine In most instances this is accompanied by other typical signs and symptoms which may have developed either gradually or suddenly

Among the earliest of these is the passing of large amounts of urine *(polyuria)* and frequency of urination These result from the loss of body fluids used for the elimination of the excess amounts of sugar When large quantities of fluids are excreted in the urine they need to be replaced in the body This causes excessive thirst *(polydipsia)* Since much of the food consumed cannot be utilized, there is a loss of body weight as well as an increase of appetite *(polyphagia)* and hunger Weakness and fatigue occur often because the sugar in the diet cannot be utilized for the body s energy requirement Generalized or localized itching is frequent, especially in the genital region Other manifestations include pain, numbness and tingling in the hands and the feet, disturbances in vision, as well as irritability and nervousness

• Since diabetes can be present without the characteristic signs and symptoms, a periodic medical examination should always include a routine urinalysis (urine examination) When there is a history of diabetes in the family, especially in the obese person, a blood sugar determination, preferably taken after a meal, is also advisable

HEREDITY AND DIABETES

There is reliable scientific information, generally accepted by physicians and scientists, that a tendency toward diabetes may be inherited In fact, it is often referred to as a hereditary disease According to the Mendelian Law of Heredity, diabetes seems to be inherited as a recessive trait, meaning that it cannot be inherited from one side of the family alone (p 198, Personal and Social Factors)

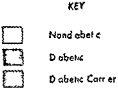
Figure 3 illustrates the relationship of heredity and expected incidence of diabetes according to the Mendelian Law of Heredity

When there is a family history of diabetes, a physical examination each year is indicated Also, there should be an earnest effort to maintain desirable or ideal weight, that is, the weight considered the best for the individual according to sex, age, height and body build (See Weight Charts Appendix, pp 201 203)

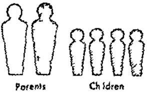
HEREDITY AND EXPECTED INCIDENCE OF DIABETES*

How the Mendelian Law of Heredity Applies to Parents and Their Children

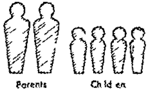
A carrier is an individual male or female who although free of a disease transmits to his or her offspring the tendency to or the potentiality for the disease from his or her ancestors



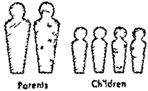
When a diabetic marries a nondiabetic who is not a carrier it is almost certain that none of their children will develop diabetes, but they will be carriers



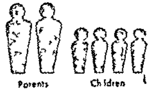
In a marriage of two carriers 25% of their children will be diabetic, 75% will be carriers



When a diabetic marries a carrier, 50% of their children will become diabetic and 50% will be carriers



If two diabetics marry all of their children will become diabetic eventually



* Adapted from Forecast American Diabetes Association Inc 1953

FIGURE 3

DIABETES AND OBESITY

Statistics have shown that there is a definite relationship between the incidence of diabetes and obesity (Fig 4) Although the exact reason for this *association is not known, there is suffi*cient evidence to indicate that persons who are overweight are more vulnerable One explanation that has been proposed is that with susceptible individuals an excess of food intake places demands upon the pancreas for an extra supply of insulin this causes overactivity of the gland with eventual exhaustion resulting in diabetes

There is general agreement that obesity is a health hazard regardless of the presence of diabetes or other conditions As overeating in most instances, is the cause of obesity, care is necessary in the selection of food for the maintenance of desirable weight as well as for serving one's physical requirements

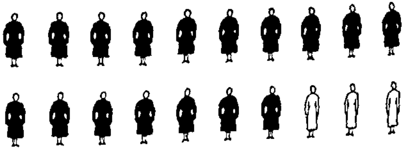
AGE, SEX AND DIABETES

Diabetes can develop at any age The highest incidence occurs from 40 to 60 years of age, while the percentage in infancy and childhood is comparatively small Diabetes does occur in the 70's and the 80's although the incidence is much lower than in the middle age group

INCIDENCE OF OVERWEIGHT BEFORE ONSET OF DIABETES*

OUT OF EVERY **20** DIABETICS OVER 40 YEARS OF AGE

17 WERE OVERWEIGHT BEFORE ONSET



* Metropolitan Life Insurance Company

FIGURE 4

TREATMENT FOR DIABETES

It should always be a great comfort to patients to learn that there is definite treatment for diabetes which when followed conscientiously, will help immeasurably in the achievement and the maintenance of controlled diabetes

Factors in Treatment

No one plan of treatment can be prescribed for all patients since requirements are determined on an individual basis However, the treatment always includes a diet which contains adequate kinds and amounts of foods to supply food constituents for body needs In many instances, in addition to the prescribed diet, insulin therapy or possibly the use of oral drugs, is needed for diabetic control Together with these, treatment includes carefully regulated exercise, a regular routine in daily living as well as special attention to personal hygiene

Controlled Diabetes

The following standards have been established to describe controlled diabetes These criteria should serve as a goal to be achieved whenever possible

Weight Maintained at desirable or ideal level (pp 201 203)

Signs and Symptoms of Diabetes Absent (p 4)

Blood-Sugar Levels Within limits of safety (p 3)

Urine Sugar Little to none (p 148)

Acidosis Absent (p 159)

Insulin Reactions Absent (p 137)

The treatment for diabetes must be followed every day all the patient's life and no detail must be overlooked Thus cared for and controlled diabetes should not interfere with a full and normal way of life

2. NORMAL AND DIABETIC DIETS

THE TREATMENT for diabetes always includes a carefully regulated diet This diet is individualized, and that which is applicable to one person is not always recommended for another Such factors as physical activity, present weight in relationship to ideal weight, the usual amount of food eaten and the severity of the diabetes and many other considerations all lend themselves to determining the best dietary treatment The diet prescription is always determined by the physician, but the responsibility for adhering to the diet rests with the patient

But diabetic diets have this in common—they must supply adequate kinds and amounts of the food constituents to fulfill body needs and maintain an ideal weight For this reason a knowledge of the normal diet is basically important A discussion of essential dietary information follows This furnishes one with the tools for understanding the diabetic diet and the information conducive to making that diet as elastic as possible within the dietary prescription

THE NORMAL DIET

Everyone requires an adequate diet to maintain good health An adequate diet, often called a protective diet, must contain proper amounts of certain food substances (p 18) These substances, or constituents are carbohydrate, protein, fat minerals (of which calcium and iron are especially important) and vitamins (especially vitamin A, thiamine riboflavin, niacin, ascorbic acid and vitamin D) The amounts of these food constituents, together with the number of calories in the diet, are dependent upon the sex, the age, the height, the body build and the activity of the individual

CARBOHYDRATE

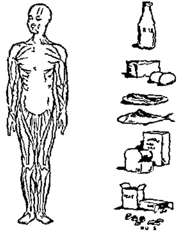
STARCHES—SUGARS

For energy to work and play



PROTEIN

For growth muscle and repair



FAT

For energy to work and play



THE FOOD CONSTITUENTS, FOODS THAT

Carbohydrate is the food constituent that *often is called a fuel food, for*, when burned in the body, it provides the energy to work and to play When taken in excess of energy needs carbohydrate can be converted into fat which is then deposited in the body

Carbohydrate is found in bread, cereals macaroni potato, dried peas and beans, flour, rice vegetables, fruit and fruit juices, in sweets* such as sugar, candy, jelly and honey, and desserts, such as pie, cake and cookies, and in tonic or pop

Protein is the food constituent that is necessary for growth, for building muscle and for repairing body tissue Without protein there can be no known life and there can be no growth

Protein is found in animal foods, such as milk cheese, eggs, meat and fish It is also found in vegetable foods such as beans peas, potatoes, bread, cereals and nuts

Fat, also a fuel food, is again a food constituent that provides the body with energy for its activity When not used for that purpose it is deposited in the body as fat

Fat is found in dairy products, such as milk, cream, butter and cheese, in eggs, as well as in the fat of meat or fish and in nuts and oils

* Not used in the diabetic diet.

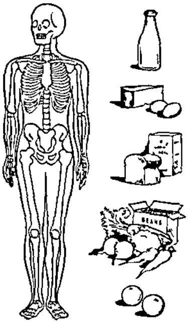
Figure 5

THEIR PURPOSE AND THE SUPPLY THEM

CALCIUM
For bones and teeth

Calcium is the food constituent that helps to build strong bones and teeth It is the greatest part of the bone structure in the body and is essential to the needs of the heart, the nerves and the muscles

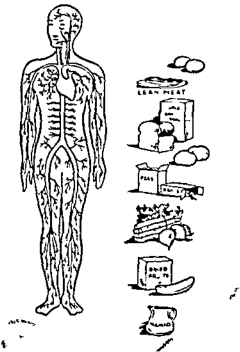
Calcium is found in dairy products, especially milk and cheese, in vegetables, especially the green and leafy ones, in fruits, especially citrus and dried, and in whole grain bread and cereals



IRON
For blood

Iron is a food constituent necessary for healthy blood Iron is one of the factors responsible for the color and the condition of the blood The blood carries food substances to every part of the body for the particular need of each part

Iron is found in eggs liver, lean meat, whole grain and enriched bread and cereal, molasses, dried fruits and vegetables, especially those that are leafy and green



Ficure 6

VITAMINS

For growth health and vigor

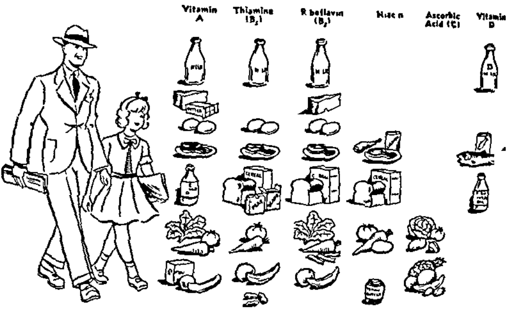


Figure 7

Vitamin A is essential for the growth and the health of people of all ages. It is especially important in preventing night blindness and in helping the body to resist infection in the respiratory and the gastro-intestinal tracts. *The principal food sources of vitamin A are as follows:*

Dairy products
Eggs

Yellow vegetables
- carrots
- sweet potato
- pumpkin
- squash

Green vegetables
- spinach
- broccoli
- green pepper
- beet greens
- escarole
- peas
- string beans

Fruits
- apricots
- prunes
- cantaloupe
- peaches

Liver
Fish liver oils

Thiamine (vitamin B_1) helps to maintain and to stimulate the appetite, aids regular bowel movement, is essential in keeping the nerves and the muscles healthy, and is necessary in the burning of carbohydrate. *The principal food sources of thiamine are as follows:*

Whole grain and enriched breads
Whole grain and enriched cereals
Meat, poultry and liver
Peas
Beans
Leafy vegetables
Potato
Nuts
Fruits
- orange
- grapefruit
- banana

Riboflavin (vitamin B_2) is concerned in the burning of carbohydrate in the body. It is necessary for growth, for good eyesight and for healthy skin. *The principal food sources of riboflavin are as follows:*

Dairy products
Eggs
Lean meat, especially liver
Vegetables, green, leafy and seed
Whole grain and enriched breads
Whole grain and enriched cereals
Prunes

Niacin plays an important role in keeping the nerves and the body tissues healthy. *The principal food sources of niacin are as follows:*

- Meat
- Poultry
- Salmon
- Whole grain and enriched breads
- Whole grain and enriched cereals
- Tomatoes
- Carrots
- Potatoes
- Peanut butter
- Peanuts

Ascorbic acid (vitamin C) is essential for the normal development and the nutrition of bones, teeth and gums. It also helps to build and to maintain the strength of the walls of the small blood vessels. *The principal food sources of ascorbic acid are as follows:*

- Fruits, especially
  - cantaloupe
  - grapefruit
  - lemon
  - orange
  - tangerine
  - strawberries
- Vegetables, especially raw cabbage and green pepper
- Tomatoes, cooked and raw
- Liver

Vitamin D assists the body in making the best use of calcium and phosphorus in the formation of bones and teeth. It also promotes growth and aids in the prevention of rickets. *The principal food sources of vitamin D are as follows:*

- Fish liver oils
- Milk, especially when fortified with vitamin D
- Oily fish, salmon, herring and sardines
- Egg yolk
- Butter
- Liver

FOOD AND CALORIES

Through study and research scien t sts have been able to determine the amounts of food constituents which the body requires da ly and also the number of calories needed for activity Calorie is the term used to express the heat producing value in food or in other words the amount of energy released when food is burned in the body

Calories are furnished by only 3 of the food constituents carbohydrate protein and fat M nerals and vitamins do not supply calories The body re ceives about 4 calories from every gram of carbohydrate 4 calories per gram of protein and about 9 calories per gram of fat

Milk which contains carbohydrate protein and fat is used as an example of calorie calculation One glass of m lk (8 ounces) contains 12 grams of carbohydrate 8 grams of protein and 10 grams of fat Since carbohydrate and protein supply 4 calories for every gram then 48 calories are produced from the 12 grams of carbohydrate (12 × 4) and 32 calories from the 8 grams of protein (8 × 4) By us ng a similar method of calculation 10 × 9 or 90 calories will be obtained from the fat The number of calories from the carbohydrate the protein and the fat in one glass of milk 48 + 32 + 90 when added will total 170 calories The number of calories supplied from all foods can be determined in this manner

Calories supplied from carbohydrate foods such as sugar are called empty calories since they contain no other food constituents For this reason it is essential for the maintenance of health that the caloric requirement be supplied from the foods which con tribute other food constituents as well

The chart on page 16 shows in summary the various foods that are the principal sources of the food con stituents (Fig 8) Note for example how many times m lk cheese meat and other foods appear across the col umns These foods contain not just one constituent but many When a food supplies many it may be con sidered a good source of the food con st tuent and therefore is included in a *protective diet* (p 18)

FOODS THAT ARE THE PRINCIPAL

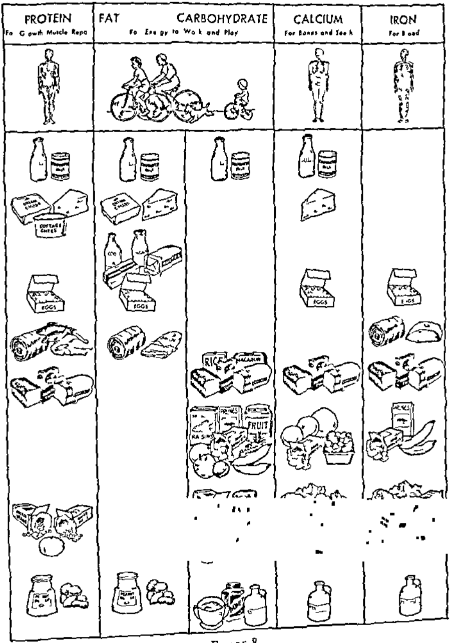
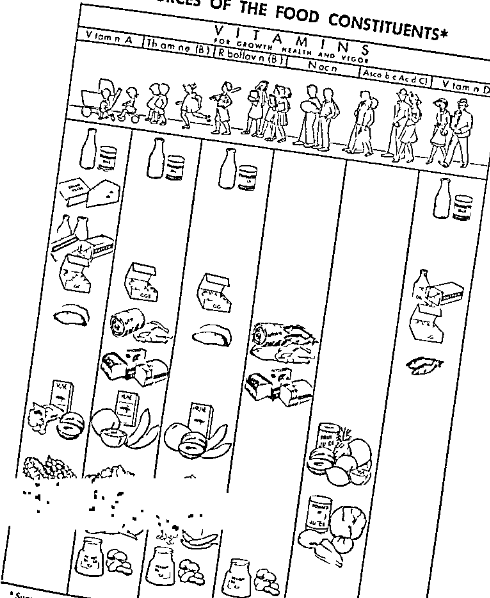


Figure 8

SOURCES OF THE FOOD CONSTITUENTS*



*Sugar, molasses, maple syrup, honey and other sweets are not used in the diabetic diet. (Prepared by the Frances Stern Food Clinic in cooperation with the Maltex Co., Burlington, Vt.)

THE PROTECTIVE DIET

(The Normal Diet)

When certain groups of foods are included in the diet every day in certain amounts, the food constituents necessary for the protection of health will be provided adequately The 'protective diet,' as this is called, is the basis and the guide for fulfilling the needs for all diets Such a protective diet is shown below (The recommended daily needs of the body are shown in Table 19, Appendix)

THE PROTECTIVE DIET—DAILY

Milk	1 pint for the adult 3-4 cups for the child
Egg	1, preferably every day
Meat, fish or poultry	4 ounces (¼ pound)
Fats	6 teaspoons of fat, including butter, oleomargarine and other kinds of fats and oils
Fruits	At least 2 servings A citrus fruit, cantaloupe or strawberries ensures ascorbic acid
Vegetables	At least 2 servings A dark green vegetable ensures vitamin A Potato, if desired, in addition to other vegetables
Bread, Cereal, Crackers, Flour and Flour Products	6 or more servings, enriched or whole grain
Sugar and Desserts	Amount dependent upon caloric needs

This is a general statement of the desirable amounts of food to provide the necessary food constituents and sufficient calories for the normal diet However, it must be remembered that these amounts are listed for the normal diet, and that the diabetic patient usually uses less bread cereal, crackers, flour and flour products, and potato No sugar, candy or concentrated sweets should be used (p 67)

THE DIABETIC DIET

The diet for the treatment of diabetes not only should supply adequate kinds and amounts of food to fulfill body needs but also must be a means of achieving or maintaining the ideal or desirable weight Ideal weight is determined according to sex, age height and body build Standard charts with this information may be used as guides (Tables 15, 16, 17, Appendix, pp 201 203)

The diabetic diet prescribed by the physician is based on the desired or ideal weight in pounds, which is then converted into kilograms (Table 1), a measurement of the metric system One kilogram equals 2.2 pounds

The total food allowance is considered in relation to the patient's actual weight as compared with the ideal weight and also with the amount of the patient's physical activity Sufficient food can then be allowed to supply the needed calories The hard working laborer probably will require more food to provide energy than the man in sedentary occupation Similarly, the woman who works at a sedentary occupation such as secretarial work, may need less food than one engaged in housework

TABLE 1 CONVERSION OF POUNDS TO KILOGRAMS

2.2 Pounds = 1 Kilogram

POUNDS	KILOGRAMS	POUNDS	KILOGRAMS
22	10	120	55
25	11	125	57
30	13	130	59
35	16	135	61
40	18	140	64
45	20	145	66
50	22	150	68
55	25	155	70
60	27	160	73
65	29	165	75
70	32	170	77
75	34	175	79
85	39	180	82
95	43	185	84
105	48	190	86
110	50	195	89
115	52	200	91

THE PROTECTI'

(The Normc

When certain groups of foods are I
included in the diet every day in cer
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tective diet," as this is called, is the

THE PROTECTI

Milk

Egg
Meat, fish or poultry
Fats

Fruits

Vegetables

Bread, Cereal, Cracke
and Flour Products

Sugar and Desserts

This is a general statemer
desirable amounts of food to
the necessary food constituer
sufficient calories for the norm
However, it must be rememberc
these amounts are listed for the

wice as many calories per gram as carbohydrate and protein, the patient must not exceed the amount of fat prescribed

SUMMARY OF NORMAL AND DIABETIC DIETS

The following Table has been prepared to summarize the comparison of the food constituents in the normal and diabetic diets

TABLE 2 DAILY NEEDS FOR NORMAL AND DIABETIC DIETS

Food Constituents	Normal Diet *Grams per Kilogram of Ideal Body Weight*		Diabetic Diet *Grams per Kilogram of Ideal Body Weight*	
	Adult	Child	Adult	Child
Carbohydrate	4 to 6	6 to 10	Usually ½ low Normal	Normal
Protein	1 to 1½	1 to 3	Normal	Normal
Fat	1 to 2	2 to 4	Usually low Normal	Normal
Minerals	*	*	Normal	Normal
Vitamins†	*	*	Normal	Normal

*See Recommended Daily Needs in the Appendix page 206

†Supplementary vitamins are indicated for diets containing less than 1 500 calories

THE FOOD CONSTITUENTS IN THE DIABETIC DIET

The diabetic diet is much like that for the normal person but there are a few changes which are most important For the *adult* the diet contains normal amounts of the following food constituents protein, usually fat, minerals and vitamins As a rule, carbohydrate is lower than normal (Table 2) For the *child* the diabetic diet contains normal amounts of all the food constituents (Table 2) The total calories furnished by the diet is calculated to ensure sufficient caloric intake for physical activity Sugar and concentrated sweets are excluded from the diabetic diet (p 67)

Carbohydrate (Starches and Sugar)

Since all the carbohydrate in the diet is available as sugar in the body, the foods that supply carbohydrate need special attention A definite amount of this food constituent is determined by the physician and any error in eating too much or too little can make the difference between success or failure in the prescribed treatment

The carbohydrate for the *adult* must be lessened, usually to the extent of one half of the normal allowance (see Appendix p 206, Recommended Daily Needs) *Children* with their needs for growth as well as activity usually require amounts of carbohydrate within normal limits (see Appendix, p 206, Recommended Daily Needs)

Protein

The protein allowances for both adults and children are usually the same as those recommended for the normal diet (see Appendix, p 206 Recommended Daily Needs) The protein in the diet not only must be calculated to ensure adequate amounts, but also because about 60% of the total amount is converted into sugar in the body

There are two kinds of protein one is called 'complete protein and the other incomplete protein ' The former refers to such protein foods as milk, cheese, eggs, meat, fish and poultry These are superior to incomplete protein foods which include vegetables such as peas, beans and nuts From one third to one half of the protein in the diet should be supplied from complete protein foods which are illustrated on pages 48 and 49 The incomplete protein foods are included in the printed list of protein exchanges for purposes of reference and calculation of total protein in the diet (p 47)

Fat

The fat prescription in the diabetic diet is usually within normal limits Daily allowance of fat depends upon both the activity and the weight of the patient Sometimes, as in the case of overweight people, the fat allowance may be lower than normal (see Appendix, p 206, Recommended Daily Needs)

The function of fat, much like carbohydrate, is to furnish the body with energy But as fat contributes over

HOUSEHOLD WEIGHTS AND MEASURES

The amounts of foods in the daily diet are listed in terms of household weights and measures, such as teaspoons, tablespoons cups, saucedishes, by size or number These weights and measures are learned with surprising ease by constant use The practice of using household measurements enables one to select sufficiently correct amounts of foods allowed in the diet with assurance, without the mandatory use of scales Such time saving methods help the patient to enjoy normal mealtimes with family and friends

TABLE 5 HOUSEHOLD WEIGHTS AND MEASURES

1 gallon	=	4 quarts
1 quart	=	4 cups and weighs about 960 grams
1 cup	=	½ pint = 240 grams = 8 fluid ounces
2 cups	=	1 pint
2 pints	=	1 quart
1 teaspoon	=	5 grams
1 dessert spoon	=	10 grams
1 tablespoon	=	15 grams
2 tablespoons	=	30 grams (1 ounce)
3 teaspoons	=	1 tablespoon
16 tablespoons	=	1 cup (standard measurement)
A rounded spoonful approximates usually 2 level spoonfuls		
A heaping spoonful approximates usually 3 level spoonfuls		
1 saucedish approximates usually ½ cup		
1 full saucedish approximates usually ¾ cup		
1 heaping saucedish approximates usually from 1 to 1½ cups		
1 scant saucedish approximates usually from ½ to ⅓ cup		

SAMPLE DIABETIC DIETS

Once the diet prescription has been determined by the physician, it is fulfilled, making certain to include the foods necessary for a protective diet (p 18) The kinds and the amounts of foods selected for this purpose are shown in the following sample diabetic diets for the adult and the child The lists of food exchanges (p 25) will furnish the information needed for varying the diet

TABLE 3 SAMPLE DAILY DIABETIC DIET FOR THE ADULT*

Milk	2 glasses (1 pint) or exchange
Cheese	1 ounce or exchange
Egg	*1 or exchange*
Meat Fish or Poultry	4 ounces or exchange
Butter	3 teaspoons or exchange
Fruit	*4 servings (include 1 good source ascorbic acid)*
Vegetables, Group A	Unlimited amount
Group B	1 serving (include 1 dark green leafy vegetable)
Bread	*5 slices or exchange*
Tea, Coffee, Clear Broth	As desired

* This diet contains approximately 150 grams of carbohydrate
70 grams of protein
70 grams of fat
1 500 calories

TABLE 4 SAMPLE DAILY DIABETIC DIET FOR THE CHILD*

Milk	4 glasses (1 quart) or exchange
Egg	1 or exchange
Meat Fish or Poultry	4 ounces or exchange
Butter	3 teaspoons or exchange
Fruit	5 servings (include 1 *good source ascorbic acid*)
Vegetables Group A	Unlimited amount
Group B	1 serving (include 1 dark green leafy vegetable)
Bread	*6 slices or exchange*
Broth	As desired

* This sample diet has been calculated on the basis of the recommended allowances for the child 8 12 years of age

This diet contains approximately 200 grams of carbohydrate
80 grams of protein
70 grams of fat
1,800 calories

HOUSEHOLD WEIGHTS AND MEASURES

The amounts of foods in the daily diet are listed in terms of household weights and measures, such as tea spoons, tablespoons, cups, saucedishes, by size or number These weights and measures are learned with surprising ease by constant use The practice of using household measurements enables one to select sufficiently correct amounts of foods allowed in the diet with assurance, without the mandatory use of scales Such time saving methods help the patient to enjoy normal mealtimes with family and friends

TABLE 5 HOUSEHOLD WEIGHTS AND MEASURES

1 gallon	=	4 quarts
1 quart	=	4 cups and weighs about 960 grams
1 cup	=	[illegible] pint = 240 grams = 8 fluid ounces
2 cups	=	1 pint
2 pints	=	1 quart
1 teaspoon	=	5 grams
1 dessert spoon	=	10 grams
1 tablespoon	=	15 grams
2 tablespoons	=	30 grams (1 ounce)
3 teaspoons	=	1 tablespoon
16 tablespoons	=	1 cup (standard measurement)

A rounded spoonful approximates usually 2 level spoonfuls
A heaping spoonful approximates usually 3 level spoonfuls
1 saucedish approximates usually $^1/_2$ cup
1 full saucedish approximates usually $^3/_4$ cup
1 heaping saucedish approximates usually from 1 to 1[illegible] cups
1 scant saucedish approximates usually from [illegible] to $^1/_3$ cup

Once the patient is familiar with the diet prescription in terms of the total food for the day, he will be able to vary the diet with the use of food exchanges These exchanges will be learned readily with constant use so that available foods and "dishes" may be chosen with confidence, still keeping within the limits of the prescribed diet With this information the selection of food at home or on the outside can be accomplished with ease

Hundreds of meals need planning and preparation every year in every household The use of food exchanges will enable the patient to partake of family meals without imposing an additional burden on the housekeeper Seasonable foods can be used, and advantage can be taken of "better buys" or special food sales in the usual fashion

Consideration of these factors has prompted the detailed discussion of food exchanges that follows Pictures as well as printed lists have been prepared so that one can readily see and learn the possible varieties of foods that may be used The following index for the food exchanges is included for easy reference These and additional food values can be found in the TABLE OF FOOD VALUES in the Appendix (pp 208 to 218).

INDEX FOR FOOD EXCHANGES LISTS

The exchanges for milk will be given first consideration, since milk and milk products contain appreciable amounts of all 3 constituents—carbohydrate, protein and fat Milk, in addition to being a good source of these 3 constituents, is also an excellent source of calcium and phosphorus, as well as a good source of vitamin A, thiamine, riboflavin, niacin and vitamin D (in milk to which vitamin D has been added) Therefore, milk should be included in the diet, but only in the amount prescribed

The milk exchanges have been divided into 3 groups whole milk, nonfat milk and cheese Whole milks, in the first group are exchangeable one *for the other* When nonfat milks are exchanged for whole milk, 2 fat exchanges are added to the diet because butter milk, skimmed milk and similar *products contain no fat*

The cheeses which are found in the third group may be exchanged for whole milk, provided that additional carbohydrate is taken Cheese contains little or no carbohydrate Therefore, one may add an extra serving of fruit to the diet which contains about the same amount of carbohydrate (10 grams) as is contained in 1 glass of whole milk

Whenever one wishes to make an exchange for milk it may be done *according to the exchanges listed and* pictured on the following pages

Milk may be used as a beverage, in soups, in chowders, with cereals or fruit, or in cooking

Milk Exchanges

Whole Milk

Each of the following servings of milk contains about 12 grams of carbohydrate, 8 grams of protein and 10 grams of fat, and may be used in exchange for 1 cup (8 ounces) of whole milk.

Dried milk, whole	4 tablespoons
Evaporated milk, whole	½ cup
Goat's milk	1 cup
Whole milk, family	1 cup
Whole milk, homogenized	1 cup
Yogurt, plain	1 cup

Nonfat Milk

Each of the following servings of milk contains about 12 grams of carbohydrate and 8 grams of protein but little or no fat. These may be used in exchange for 1 cup (8 ounces) of whole milk by adding 2 fat exchanges (10 grams) to the diet.

Buttermilk	1 cup
Dried milk, skimmed	3 tablespoons
Evaporated milk, skimmed	½ cup
Skimmed milk	1 cup

Cheese*

Each of the following servings of cheese contains about 8 grams of protein and 10 grams of fat but little or no carbohydrate. They may be used in exchange for 1 cup of whole milk by adding 1 fruit exchange (10 grams of carbohydrate) to the diet.

American (Cheddar)	1 ounce
Camembert†	1 ounce
Cottage†	2 rounded tablespoons
Edam	1 ounce
Limburger	1 ounce
Old English Spread	2 tablespoons
Parmesan	4 tablespoons
Roquefort	1 ounce
Swiss	1 ounce

* Certain cheeses, such as cream cheese and cheese spread, have little protein and calcium. Therefore they have not been included on the cheese exchange list but will be found on the list for fat exchanges. All cheeses contain less of the B complex vitamins. This factor should be given consideration when cheese is used consistently in exchange for milk.

† Cottage cheese and Camembert cheese contain less calcium and should not be used too often as an exchange for milk. When cottage cheese is used add 2 fat exchanges (10 grams) to the diet.

Milk Exchanges

Whole Milk

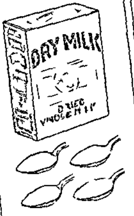
Each of the following servings contains about 12 grams of carbohydrate 8 grams of protein and 10 grams of fat and may be used in exchange for 1 cup (8 ounces) of whole milk

Whole milk (family or homogenized)



1 cup

Dried whole milk



4 tablespoons

Evaporated whole milk



½ cup

Nonfat Milk

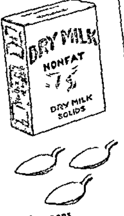
Each of the following servings contains about 12 grams of carbohydrate and 8 grams of protein but little or no fat These may be used in exchange for 1 cup of whole milk by adding 2 fat exchanges (10 grams) to the diet

Skimmed milk



1 cup

Dried skimmed milk



3 tablespoons

Evaporated skimmed milk



½ cup

Milk Exchanges

Cheese

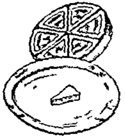
Each of the following servings contains about 8 grams of protein and 10 grams of fat but little or no carbohydrate. They may be used in exchange for 1 cup of whole milk by adding one fruit exchange (10 grams of carbohydrate) to the diet.

American (Cheddar)



1 ounce

Camembert



1 ounce

Cottage



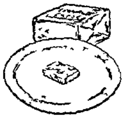
2 tablespoons (rounded)

Edam



1 ounce

Limburger



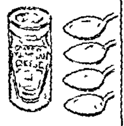
1 ounce

Old English Spread



2 tablespoons

Parmesan



4 tablespoons

Roquefort



1 ounce

Swiss



1 ounce

Breads, Cereals, Crackers, Flour and Flour Products, Vegetables

Breads, cereals, crackers, macaroni, spaghetti and many similar products are made basically from various grains and their flours, such as wheat, rye, oats or rice Although these foods and their products differ in shape, taste and ingredients, regardless of the kind, they may be considered as being ex changeable one for the other, since they are composed chiefly of carbohy drate Thus, one person may prefer white bread, and another pumper nickel, one might eat rice, while another chooses macaroni, yet all would be eating esssentially the same type of food and receiving approxi mately the same food value

This next section of food exchanges includes the many products that com prise this group, since they contain chiefly carbohydrate, small amounts of protein and little or no fat The exchanges have been based on the amount of carbohydrate contained in an average slice of American bread, most of these loaves weigh 1 pound, and when sliced, a loaf usually con tains 16 slices Each slice, then, would weigh 1 ounce (30 grams), the amount which will be considered as the stand ard throughout this book

By a procedure of simple arithmetic, one can figure the amount of any type of fresh bread equal to the American slice by determining the size of the slice that weighs 1 ounce This amount would supply approximately 15 grams of carbohydrate, equal to 3 lumps of sugar, and about 2 grams of protein Although breads will weigh less when toasted, the carbohydrate content is not changed

There are many possibilities for varying the diet Any one of the foods listed on the following pages may be exchanged for each slice of bread al lowed in the diet Vegetables which contain a high percentage of carbohy drate have been included in this list rather than with other vegetables which do not have as high a content of carbohydrate These are listed and illustrated later A discussion of spe cial breads such as *'low calorie' or* 'high protein' will be found in the section on *Food Fads on page 69*

Carbohydrate Exchanges—Breads

The following servings of foods are about equal to the food value of 1 slice of bread Most of these contain about 15 grams of carbohydrate (equal to the amount in 3 lumps of sugar), 2 grams of protein and little or no fat, and may be exchanged for 1 slice of bread

Flour and Flour Products

Cornstarch	2 tablespoons	Noodles cooked	½ cup
Flour	3 tablespoons	Spaghetti cooked	½ cup scant
Macaroni cooked	½ cup scant	Wheat cracked, cooked	½ cup

Breads*

Item	Amount	Item	Amount
Bagel	½	Pumpernickel 4¼" x 3½" x ¼"	1 slice
Baking powder biscuit	1 small	Raisin bread	1 slice
Boston brown bread (½" thick)	1 slice	Roll, hamburg	½
Bread crumbs dry, grated	¼ cup	hot dog	½
Bulkie	½	Rye bread (1 ounce)	1 slice
Cornbread	1½" cube	White bread (1 ounce)	1 slice
Melba toast	4 pieces	Whole wheat bread (1 ounce)	1 slice
Muffin plain	1 small		

Cereals and Cereal Products

Item	Amount	Item	Amount
Barley	1½ tablespoons	Rice dry pre-cooked	3 tablespoons
Cereal cooked	½ cup, scant	Rice flakes	½ cup
Cornflakes	¾ cup	Rice Krispies	¾ cup
Corn grits, cooked	½ cup	Rice puffed	1½ cups
Corn popped	1½ cups	Tapioca dry	2 tablespoons
Grape nuts	2 tablespoons	Wheat puffed	1½ cups
Muffets	1 average	Wheat shredded	1 small (½ large)
Rice cooked	½ cup scant	Wheaties	¾ cup

Crackers

Item	Amount	Item	Amount
Animal crackers	7	Milk (Royal Lunch)	1½
Arrowroot	3	Oyster	20
Butter thins	4	Pilot (Crown)	¾
Cheese Tid Bits	35	Ritz plain or cheese	4
Corn thins	8	Ry Krisps (double square)	3
Cracker meal	2 tablespoons	Saltines	5
Crax	4	Soda	3
Graham (2½" square)	3	Triscuit	3
Matzoth (square or round)	¼	Uneeda Biscuit	3
Matzoth meal	3 tablespoons	Venus Wafers	4
Melba toast	4 pieces	Wheat thins	8

Vegetables

Item	Amount	Item	Amount
Beans baked	2 tablespoons	Corn fresh	1 small ear
Beans dried cooked	¼ cup scant	Cowpeas	½ cup, scant
Beans Lima cooked	½ cup	Peas dried cooked	¼ cup scant
Chickpeas dry	2 tablespoons	Potato sweet	¼ small
Corn canned	¼ cup scant	Potato white	1 small

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*Italian French and breads of other nationalities may be used provided that each slice is in weight to the 1-ounce slice of American bread These amounts also apply to toasted br

Carbohydrate Exchanges—Bread

Each of the following servings contains about 15 grams of carbohydrate, equal to the amount in 3 lumps of sugar. Each serving may be used in exchange for 1 slice of bread.

Breads

Baking powder biscuit



1 small

Muffin, plain



1 small

Roll, Parker House



1 roll

Rye bread (plain or toasted)



1 slice

White bread (plain or toasted)



1 slice

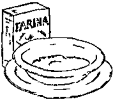
Whole wheat bread (plain or toasted)



1 slice

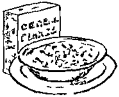
Cereal and Cereal Products

Cereal, cooked



½ cup, scant

Cereal Flakes



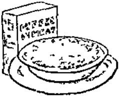
¾ cup (average)

Grapenuts



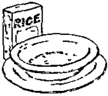
2 tablespoons

Puffed Wheat



1½ cups

Rice, cooked



½ cup, scant

Shredded Wheat



⅔ large 1 small

Carbohydrate Exchanges—Bread

Each of the following servings contains about 15 grams of carbohydrate, equal to the amount in 3 lumps of sugar. Each serving may be used in exchange for 1 slice of bread.

Crackers

Crax or Ritz



4 crackers

Graham, medium



3 crackers

Melba Toast



4 pieces

Oyster



20 crackers

Ry Krisp



3 crackers

Saltines



5 crackers

Soda



3 crackers

Uneeda Biscuits



3 crackers

Venus



4 crackers

Flour and Flour Products

Flour



3 tablespoon

Vegetables

Corn



½ cup or 1 small ear

Potato, sweet



½ small

Potato, white



1 small

Canned, Frozen Canned and Dried

The diabetic patient may use soups, provided that the correct exchanges are made for their ingredients Soups are wholesome, convenient and for the most part economical For many, they serve as an important part of the meal The use of a variety of soups will help in avoiding a stereotyped aspect to mealtimes, to say nothing of adding an *extra course to the menu*

Various garnishes may be used with soups to enhance their attractiveness and yet not increase the food value of the dish For example, a few finely diced or shredded vegetables can be added to broth or consomme, or a thin slice of lemon or lemon sprinkled with parsley can be floated at the top

Canned and frozen soups contain varying amounts of carbohydrate, protein and fat For convenience, these soups have been arranged according to the amount allowed in exchange for 1 slice of bread (approximately 70 calories) The figures used in the exchange lists are based on the condensed soup in the can *before water or milk has been added* When, in preparation, the soup is diluted with water, no food value is added When milk is added, it must be considered *as part of the milk allowance for the* day

However, the exchanges listed for the dried soups represent the reconstituted amount, *or in other words the amount obtained after the soups are prepared with water according to the* directions on the package Therefore, the exchanges listed in the dried soups are for these prepared amounts, which are equal to the food value of 1 slice of bread

Carbohydrate Exchanges—Soups

The following servings of foods are about equal to the food value of 1 slice of bread. Most of these contain about 15 grams of carbohydrate (equal to the amount in 3 lumps of sugar), 2 grams of protein and little or no fat, and may be exchanged for 1 slice of bread.*

Condensed Canned Soups (Before liquid has been added)

Asparagus	½ cup	(8 T)†
Bean	¼ cup	(4 T)
Beef	⅜ cup	(6 T)
Beef Noodle	½ cup	(8 T)
Bouillon	Unlimited	
Celery	½ cup	(9 T)
Chicken, Cream of	½ cup scant	(7 T)
Chicken Gumbo	⅝ cup	(10 T)
Chicken Noodle	½ cup	(8 T)
Chicken with Rice	¾ cup	(12 T)
Clam Chowder (Manhattan Style)	½ cup scant	(7 T)
Consommé	Unlimited	
Minestrone	⅜ cup	(6 T)
Mushroom, Cream of	¼ cup	(4 T)
Onion	½ cup	(8 T)
Pea, Green, Split	¼ cup	(4 T)
Scotch Broth	⅜ cup	(6 T)
Tomato	⅜ cup	(6 T)
Turkey with Noodles	½ cup	(9 T)
Vegetable	½ cup, scant	(7 T)

Condensed Frozen Soups (Before liquid has been added)

Clam Chowder (New England Style)	¼ cup	(4 T)
Pea	¼ cup	(4 T)
Oyster Stew	¼ cup	(4 T)
Potato, Cream of	⅜ cup, scant	(5 T)
Shrimp, Cream of	¼ cup, scant	(3 T)

Dried Soups (After liquid has been added)

Chicken Noodle	1 cup
Beef Flavor Noodle, with Vegetables	1 cup
Onion	2 cups
Tomato Vegetable	1 cup
Pea	½ cup

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* Figures have been taken from the U. S. Department of Agriculture (Handbook No. 8), Campbell Soup Company, H. J. Heinz Company and T. J. Lipton Company.

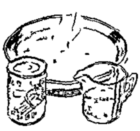
† The abbreviation "T" has been used for level tablespoon.

Carbohydrate Exchanges—Soups

Each of the following servings of foods is about equal to the food value of 1 slice of bread *Most of these contain about 15 grams of carbohydrate (equal to the amount in 3 lumps of sugar), 2 grams of protein and little or no fat and may* be exchanged for 1 slice of bread

Canned Condensed Soups (Before liquid has been added)

Asparagus



½ cup

Beef



⅜ cup

Beef noodle



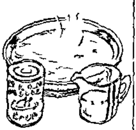
½ cup

Chicken cream of



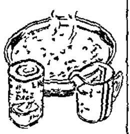
½ cup scant

Chicken noodle



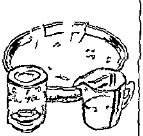
½ cup

Chicken with rice



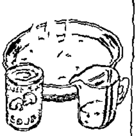
¾ cup

Clam chowder (Manhattan)



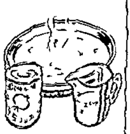
½ cup, scant

Mushroom cream of



¼ cup

Onion



½ cup

Carbohydrate Exchanges—Soups

Each of the following servings of foods is about equal to the food value of 1 slice of bread. Most of these contain about 15 grams of carbohydrate (equal to the amount in 3 lumps of sugar), 2 grams of protein and little or no fat and may be exchanged for 1 slice of bread.

Canned Condensed Soups (Before liquid has been added)

Pea green split



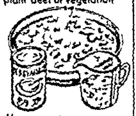
¼ cup

Tomato



⅓ cup

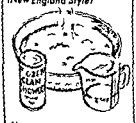
Vegetable plain beef or vegetarian



½ cup scant

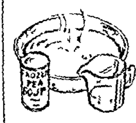
Frozen, Canned, Condensed Soups (Before liquid has been added)

Clam chowder (New England Style)



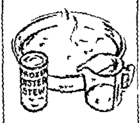
½ cup

Pea



¼ cup

Oyster stew



¼ cup

Dried, Reconstituted Soups (After liquid has been added)

Chicken noodle



1 cup

Beef flavor noodle soup with vegetables



1 cup

Pea



½ cup

CARBOHYDRATE EXCHANGES—FRUIT

Fruits contain not only carbohydrate but other food constituents, particularly the minerals, calcium and iron, and the vitamins, especially ascorbic acid, as well as vitamin A, thiamine and riboflavin Fruits are classified for the diabetic diet according to the amount of carbohydrate that they contain A small orange measuring $2\frac{1}{2}$ inches in diameter and weighing about 100 grams contains about 10 grams of carbohydrate or the amount equal to about 2 lumps of sugar The following charts and illustrations list the various kinds and the amounts of fruits that have the same content of carbohydrate as the orange (pp 39 41)

These fruits may be exchanged, one for the other, but it is important that one citrus fruit, strawberries or cantaloupe be included in the diet every day for the ascorbic acid that they contribute

Since all fruits contain sugar, it should be remembered that the amount used is limited to that specified in the diet Particular attention should be given to the size of the portions of fruit For example, apple is listed as 1 serving of fruit When a large apple is used it must be considered as an exchange for 2 servings The same applies to bananas and pears as well as to other fruits which easily can be taken in amounts that exceed the quantities prescribed

Fruits may be eaten fresh as purchased, or prepared in salads, in fruit cup or as fruit juice, or they may be prepared with gelatin, or baked or stewed without sugar Cooked, canned or frozen fruits to which sugar has been added should not be used This information is always stated on the label of the container

CARBOHYDRATE EXCHANGES—FRUIT

Each of the following servings contains about 10 grams of carbohydrate equal to the amount in 2 lumps of sugar and may be exchanged for each other

Apple	1 small
Apple	½ medium
Applejuice	⅓ cup
Applesauce unsweetened	½ cup
Apricots dried	4 small halves
Apricots fresh	2 whole
Banana	½ medium
Berries	½ cup
*Cantaloupe 4½ inches diameter	½
*Cantaloupe 6 inches diameter	¼
Cherries sweet	15-18 small
Cherries sweet	10 large
Cranberries fresh	1 cup
Cranberries cooked unsweetened	½ cup
Dates, dried	2
Dates fresh	2
Figs dried	1 medium
Figs fresh	1 medium
*Grapefruit	½ small
*Grapefruit juice unsweetened	½ cup
Grapes American varieties	15
Grapes green seedless	40
Grape juice	¼ cup
Honeydew melon 5 inches diameter	¼
*Lemon juice	¾ cup
Lime juice	¾ cup
*Orange	1 small
*Orange juice unsweetened	½ cup
Peach	1 medium
Pear	½ medium
Pear	1 small
Pineapple fresh 3½" x ¼" thick ½ cup diced	1 slice
Pineapple juice unsweetened	⅓ cup
Plums	2 medium
Prunes	2 medium
Prune juice unsweetened	¼ cup
Raisins	1 full tablespoon
Rhubarb raw cubed	2 cups
*Strawberries	13 large
*Tangerine	2 small
*Tangerine	1 large
*Tangerine juice unsweetened	½ cup
Watermelon cubed	¾ cup
Watermelon 10" x ¾" thick	½ slice

---
* Valuable as source of ascorbic acid (vitamin C)

Carbohydrate Exchanges

Fruit

Each of the following servings contains about 10 grams of carbohydrate, equal to the amount in 2 lumps of sugar, and may be exchanged for one another

Apple or applesauce



1 small apple or ½ cup applesauce (unsweetened)

Apricots



2 fresh or 4 small dried (halves)

Banana



½ medium

Blueberries



½ cup

Cantaloupe*



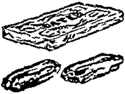
or ¼ of 6" diam

Cherries, sweet



10 large

Dates, dried or fresh



2 dates

Figs, dried or fresh



1 medium

Grapefruit* or grapefruit juice*



½ small grapefruit or ½ cup juice (unsweetened)

Grapes, American varieties



15 grapes

Grapes, green seedless



40 grapes

Honeydew melon



¼ of 5" diameter

* Valuable as source of ascorbic acid (vitamin C)

Carbohydrate Exchanges

Fruit

Each of the following servings contains about 10 grams of carbohydrate, equal to the amount in 2 lumps of sugar, and may be exchanged for one another

Orange*



1 small

Orange juice*



⅓ cup (unsweetened)

Peach



1 medium

Pear



1 small or ½ medium

Pineapple or pineapple juice



1 slice of fresh pineapple (3½" x ¾" thick), or ⅓ cup juice

Plums



2 medium

Prunes or prune juice



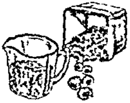
2 medium prunes or ¼ cup juice (unsweetened)

Raisins



1 full tablespoon

Raspberries



½ cup

Strawberries*



13 large

Tangerine*



2 small tangerines or ⅓ cup juice (unsweetened)

Watermelon



½ slice (¾" thick x 10"

* Valuable as source of ascorbic acid (vitamin C).

Vegetables are another group of foods that contain chiefly carbohydrate They supply a small amount of protein and usually no fat They are excellent sources of the minerals and the vitamins Vegetables are grouped according to the amount of carbohydrate that they contain some having as little as 2 or 3 grams of carbohydrate per average serving, and others as much as from 15 to 20 grams The vegetables which contain small amounts of carbohydrate are listed under one group group A (p 43) Usually they may be taken by the patient in unlimited amounts to help satisfy the appetite provided excessive amounts are not used The carbohydrate values of these vegetables may be found in the Table of Food Values (pp 217 to 218) The vegetables in group B contain larger amounts of carbohydrate and should be eaten only in the amounts prescribed *Vegetables which contain a high percentage of carbohydrate are included on the exchange list for breads* (p 31)

Vegetables may be eaten in raw or cooked form They may be used plain or with butter, in soup chowder or stews in salads or sandwiches or in the preparation of special dishes (p 54)

Carbohydrate Exchanges—Vegetables

Group A

The following vegetables may be used in unlimited amounts

Asparagus	Chicory	Pepper green or red
Bamboo shoots	Cucumber	Pimento
Beans green	Eggplant	Radish
Beans snap	Endive	Sauerkraut
Beans wax	Escarole	Spinach
Beet greens	Kale	Squash summer
Broccoli	Lettuce	Tomato
Cabbage	Mung bean sprouts	Tomato juice
Cauliflower	Mushrooms	Turnip greens
Celery	Mustard greens	Watercress
Chard	Okra	Zucchini
	Parsley	

Group B

Each of the following servings contains about 10 grams of carbohydrate equal to the amount in 2 lumps of sugar and may be exchanged for each other

Beets diced cooked	½ cup	Parsnip cooked	½ cup
Beets whole cooked	2 medium	Parsnip cooked or raw	½ medium
Brussels sprouts	9 medium	Peas canned	½ cup scant
Carrots diced cooked	1 cup	Peas fresh or frozen	½ cup
Carrots cooked or raw	1 large	Pumpkin cooked	½ cup
Collards cooked	½ cup	Rutabaga cooked	½ cup
Dandelion greens cooked	½ cup	Squash winter cooked	½ cup
Onions	2 medium	Turnip cooked	½ cup

Carbohydrate Exchanges—Vegetables

GROUP A

These vegetables may be eaten in unlimited amounts.



Carbohydrate Exchanges—Vegetables

GROUP B

Each of the following servings contains about 10 grams of carbohydrate equal to the amount in 2 lumps of sugar and 2 grams of incomplete protein and may be exchanged for one another

Beets (diced)



½ cup or 2 medium beets

Brussels sprouts



9 medium

Carrot



1 large or 1 cup diced

Collards (cooked)



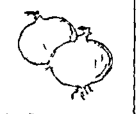
½ cup

Dandelion greens (cooked)



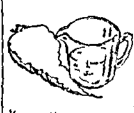
½ cup

Onions



2 medium

Parsnip (cooked)



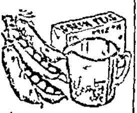
½ cup or ½ medium

Peas (canned)



½ cup scant

Peas (fresh or frozen)



½ cup

Pumpkin (cooked)



½ cup

Rutabaga, turnip (cooked)



½ cup

Squash, winter (cooked)



½ cup

PROTEIN EXCHANGES

The protein contained in foods is important in the diabetic diet for two reasons First, because protein is nec essary in all diets for the building and the repair of body tissue Second, it will be remembered that 60% of the protein in the diet can be converted into sugar in the body Therefore, the patient should give as much attention to the amounts of protein foods as is given to the carbohydrate foods in the diet

Meat and the exchanges for meat are principally protein foods They con tain almost no carbohydrate but do supply fat in varying amounts The protein in meat is a special kind called "complete protein' as it contains the amino acids essential to life Other complete protein foods are cheese, eggs, [illegible]

from these complete protein food sources

The second kind of protein foods is classified as 'incomplete protein be cause the amino acids which they con tain will not alone sustain life Ex amples of foods in this group are breads, cereals, flour and flour prod ucts, nuts, potatoes and other vege tables The carbohydrate content of many of these foods is high, and cer tain foods such as nuts and peanut butter contain high proportions of fat When incomplete protein foods are combined in the diet with complete protein foods, together they will fur nish sufficient amino acids for the nec essary functions of protein in the body

Care is needed in exchanging one [illegible]

may be exchanged for 1 ounce of meat which also contains 7 grams of com plete protein and 5 grams of fat But 1 egg should not be exchanged for a serving of dried Lima beans which, al though having 7 grams of protein (in complete) contains also 15 grams of carbohydrate Therefore, Lima beans as well as foods with similar carbohy drate content, have been included as a carbohydrate exchange and will be found on the bread exchange list

The protein exchange list that follows contains the exchanges for complete protein foods with their amounts Although most of the foods in the amounts given contain about 5 grams of fat, there are some which contain almost no fat, such as cottage cheese and white fish and chicken Others contain more than 5 grams of fat such as frankforts and sausage Unless an exchange is made fre quently these differences in fat content may be ignored

Protein Exchanges

Complete Protein Foods

Each of the following servings contains about 7 *grams of protein* and about 5 grams of fat and may be used in exchange for 1 *egg or* 1 *ounce of meat*

Food	Amount
Cheese	
Cheddar type	1 ounce
Cottage	2 rounded tablespoons
Egg	1
Fish, canned	
Crab	¼ cup
Lobster	¼ cup
Salmon	¼ cup
Sardines	3 medium (about 1 ounce)
Shrimp	5 medium (about 1 ounce)
Tuna	¼ cup
Fish, cooked	
Cod	1 ounce
Flounder	1 ounce
Haddock	1 ounce
Halibut	1 ounce
Herring	1 ounce
Mackerel	1 ounce
Salmon	1 ounce
Swordfish	1 ounce
Fish fresh shellfish	
Clams	5 medium (about 2 ounces)
Lobster	½ small
Lobster meat	¼ cup
Oysters	4 medium (about 2 ounces)
Scallops	1 large (12 pieces per pound)
Shrimp	5 medium (about 1 ounce)
Meat and Poultry, cooked	
Beef	1 ounce
Ham	1 ounce
Lamb	1 ounce
Liver	1 ounce
Pork	1 ounce
Poultry	1 ounce
Veal	1 ounce
Cold Cuts	
Bologna	1 ounce (4½"×⅛")
Liverwurst	1 ounce (4½"×⅛")
Luncheon loaf	1 ounce (4½"×⅛")
Minced ham	1 ounce (4½"×⅛")
Salami	1 ounce (4½"×⅛")
Other Meats	
Beef dried chipped	1 ounce (scant)
Frankfort	1 medium (about 2 ounces)
Sausage	2 (3"×½")

Incomplete Protein Foods

The following foods contain incomplete protein, carbohydrate and little *or no* fat except for nuts and peanut butter

- Bread (all kinds)
- Cereals (cooked and dry)
- Legumes (peas beans lentils)
- Macaroni
- Noodles
- Nuts
- Peanut Butter
- Potato white sweet
- Spaghetti

The exchanges for these foods will be found on the appropriate lists of either carbohydrate exchanges or fat exchanges

Protein Exchanges

Complete Protein Foods
Cheese, Egg, Meat and Poultry

Each of the following servings contains about 7 grams of protein and 5 grams of fat. Each serving may be used in exchange for 1 egg or 1 ounce of meat.

Cheese and Egg

Cheese, Cheddar type



1 ounce

Cottage



2 ounces
(2 rounded tablespoons)

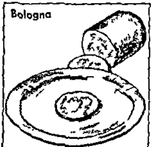
Egg



1 egg

Meat and Poultry

Bologna



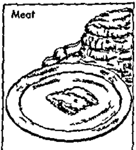
1 ounce (1 slice, 4½" x ⅛")

Frankfort



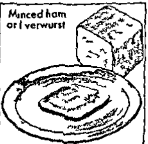
1 medium (about 2 ounces)

Meat



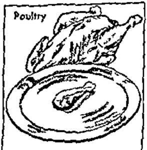
1 ounce cooked

Minced ham
or Liverwurst



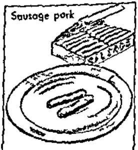
1 ounce (1 slice 4¼" x ⅛")

Poultry



1 ounce cooked

Sausage, pork



2 sausages 3" x ½"

Protein Exchanges

Complete Protein Foods

Fish and Shellfish

Each of the following servings contains about 7 grams of protein and 5 grams of fat. Each serving may be used in exchange for 1 egg or 1 ounce of meat.

Fish

Fish

(cod flounder haddock, halibut herring mackerel salmon sardine and swordfish)



1 ounce, cooked

Salmon canned



1 ounce (¼ cup)

Tuna canned



1 ounce (¼ cup)

Shellfish

Clams



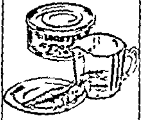
2 ounces (about 5 medium)

Crab fresh or canned



¼ cup

Lobster fresh or canned



½ small or ¼ cup

Oysters



2 ounces (about 4 medium)

Scallops



1 large (12 per pound)

Shrimp fresh or canned



1 ounce (about 5 medium)

FAT EXCHANGES

For obvious reasons the foods *which contain almost all fat and* very little of the other food constituents are commonly known as fat foods Certain foods in this group such as butter, margarine and cream contain vitamins A and D in addition, while peanut butter and nuts are good sources of protein as well as fat

Peanut butter and nuts have been included in the fat exchange list because, when used occasionally for one fat exchange, they contribute negligible amounts of protein However, when these foods are used frequently or in amounts greater than those for one fat exchange, their protein content as well as the fat should be figured For example, 2 teaspoons of peanut butter the fat exchange of 1 *teaspoon of butter, contains* approximately 3 grams of protein This amount can be ignored when used occasionally instead of one fat exchange However, when peanut butter is used in larger amounts, equal possibly to several fat exchanges, then the total protein furnished would need to be calculated as well as the fat content

Recent studies have *indicated* that the fat consumption per capita has increased significantly in this country since the first part of the 20th century Some authorities believe that there may be a relationship between this increase in fat consumption and the high incidence of *obesity, atherosclerosis* and heart disease It is also believed by some that the kinds of fat as well as their proportions in the diet may be important Therefore the practice of many physicians today is to modify the proportion of saturated and unsaturated fatty acids in the diet by using oil in place of butter, lean meats instead of meats having a high fat content, skim milk instead of whole milk as well as a restriction of the amount of eggs and cheese allowed

The servings of foods which contain approximately *the same amount of fat* as found in 1 teaspoon of butter are arranged in the following *lists and illustrations*

Fat Exchanges

Each of the following servings contains about 5 grams of fat equal to the amount in 1 teaspoon of butter

Food	Amount
Avocado small	1/8
Bacon cooked drained 6"	1 strip
Butter or margarine	1 teaspoon
*Cheese** cream	1 tablespoon
spreads	1 tablespoon
Chocolate unsweetened melted	2 teaspoons
Cream	
Heavy	1 tablespoon
Medium or light	2 tablespoons
Sour	2 tablespoons
Whipped unsweetened	2 tablespoons
Fat	
Bacon	1 teaspoon
Chicken	1 teaspoon
Fat back 3/4" cube	1 cube
Lard	1 teaspoon
Salt pork 1/4 cube	1 cube
Shortening	1 teaspoon
Suet	1 rounded teaspoon
Gravy	2 tablespoons
Nuts	
Almonds	8
Peanut butter	2 teaspoons
Peanuts	11
Pecans	6 halves
Walnuts	5 halves
Oils	
Corn	1 teaspoon
Cottonseed	1 teaspoon
Fish liver	1 teaspoon
French dressing	1 tablespoon
Mayonnaise	1 rounded teaspoon
Olive	1 teaspoon
Peanut	1 teaspoon
Salad dressing	1 tablespoon
Olives green or ripe	[illegible] large

*Cream cheese such as cream cheese and cheese spreads have little protein and calcium. Therefore they have been included on the list of fat exchanges.

Fat Exchanges

Fats, Oils, Olives, Nuts and Peanut Butter

Each of the following servings contains about 5 grams of fat equal to the amount in 1 teaspoonful. Each serving may be used in exchange for 1 teaspoonful of butter.

Lard



1 teaspoon

Mayonnaise



1 rounded teaspoon

Meat or chicken fat



1 teaspoon

Oils, corn and others



1 teaspoon

Olives, green or ripe



7 large

Peanuts



11 peanuts

Peanut butter



2 teaspoons

Pecans



6 halves

Walnuts



5 halves

Many of the foods allowed in the diet, or their exchanges, may be combined into special dishes, providing variety in the meals at home and also facilitating the selection from restaurant menus

When preparing special dishes, the total food value of their ingredients must be estimated and appropriate allowances made for them

Macaroni and cheese is used as an example Although this dish does not appear as such on the diet list, the proper exchanges can be made when the ingredients are known and analyzed Macaroni and cheese usually *is prepared with macaroni, cheese,* milk, some fat and possibly some flour The exchange can be accomplished in the following way One half cup, scant, of macaroni has about the same food *value as a slice of bread* The cheese content represents one of the protein exchanges, and the milk used would be deducted from the daily milk allotment Since ½ cup of macaroni is rather a small serving, a whole cup may be used representing 2 bread exchanges One protein exchange and 1 cup of milk complete the total exchange needed for this dish With the omission of these 3 items from the total daily food allowance, the correct exchange is made

Similarly, other special dishes can be prepared by making the appropriate exchanges for their various food ingredients Some of the more popular dishes are listed and illustrated on the pages that follow It is hoped that the use of these will not only stimulate mealtime pleasure but also encourage the patient to add to the dietary list other dishes of his own creations and choice

Exchanges for Special Dishes*

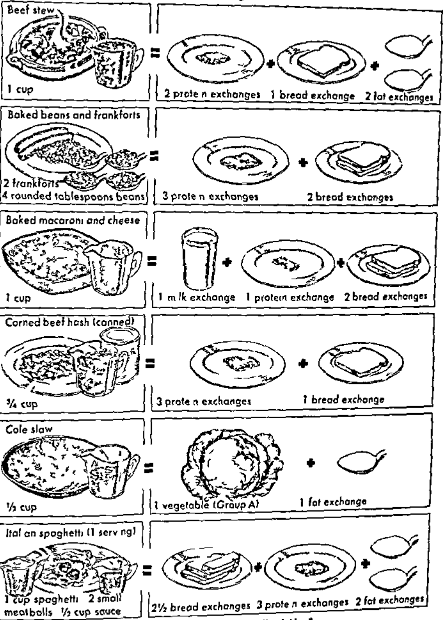
Certain "special dishes" may be included in the diet when they are used in exchange for the foods that are allowed. There are many combinations of foods which could be used, but space has permitted the inclusion of some of the more popular ones. The following list shows how "special dishes" can be exchanged.

Special Dish	Amount	Food Exchange
Beef Stew	1 cup	2 protein 1 bread 2 fat
Baked Beans and Frankforts Frankforts Baked Beans	 2 4 rounded tablespoons	3 protein 2 bread
Baked Macaroni and Cheese	1 cup	1 milk 1 protein 2 bread
Corned Beef Hash (Canned)	¾ cup	3 protein 1 bread
Coleslaw	½ cup	1 vegetable (Group A) 1 fat
Italian Spaghetti	1 serving (1 cup spaghetti, 2 small meat balls, ½ cup sauce)	2½ bread 3 protein 2 fat
Chop Suey (Chicken)	1 cup	1 bread 1 protein
Pancakes	2 pancakes (4" diameter)	1 bread 1 fat
French Fried Potatoes	5 pieces 2"×½"×½"	1 bread 1 fat
Potato Chips	15 medium, 2" diameter or 10 large, 3" diameter	1 bread 2 fat
Poultry With Stuffing	4 ounces poultry ½ cup stuffing	4 protein 1 bread 1 fat
Chili Con Carne With Beans	1 cup	2 bread 2 protein

*Exchanges have been computed from figures in U. S. Handbook No. 8 except for the following: Chili Con Carne—Heinz Nutritional Data, 1956; Italian Spaghetti—computed from basic recipe; Chicken Chop Suey—LaChoy Food Products Analyses, 1954.

Exchanges for Special Dishes*

Each of the following special dishes may be used, provided that the proper food exchanges are made

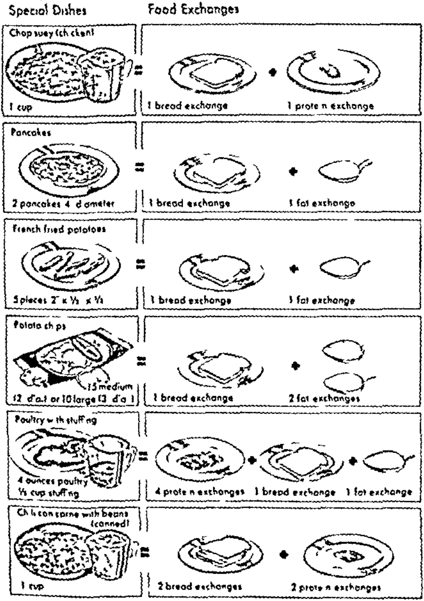


Special Dishes	Food Exchanges
Beef stew — 1 cup	2 protein exchanges + 1 bread exchange + 2 fat exchanges
Baked beans and frankforts — 2 frankforts, 4 rounded tablespoons beans	3 protein exchanges + 2 bread exchanges
Baked macaroni and cheese — 1 cup	1 milk exchange + 1 protein exchange + 2 bread exchanges
Corned beef hash (canned) — ¾ cup	3 protein exchanges + 1 bread exchange
Cole slaw — ½ cup	1 vegetable (Group A) + 1 fat exchange
Italian spaghetti (1 serving) — 1 cup spaghetti, 2 small meatballs, ½ cup sauce	2½ bread exchanges + 3 protein exchanges + 2 fat exchanges

* Exchanges have been computed from figures in U S Handbook No 8

Exchanges for Special Dishes*

Each of the following special dishes may be used provided that the proper food exchanges are made



* Exchanges have been computed from figures in U.S. Handbook No. 8 except for Chili con carne taken from Heinz Nutritional Data 1956

DESSERT EXCHANGES

In this book, special effort has been made to assure the diabetic patient of a normal way of life In this endeavor it has been shown how the diet can closely conform to that of the family Therefore, the following discussion concerning desserts has been included

Although *concentrated sweets such* as sugar,* frosting syrups and the like are not allowed, there are desserts which can be used, provided that the proper exchanges for their ingredients are made in the diet These desserts could include strawberry shortcake ice cream, custard, plain cake or gelatin desserts

For example fruit shortcake is prepared with fruit, biscuit and whipped cream The exchange for this dessert is made as follows 1 biscuit equals 1 slice of bread, 2 level tablespoons of whipped cream (unsweetened) equals 1 teaspoon of butter, and 1 *serving* of fruit needs to be subtracted from the total amount of fruit allowed for the day Therefore, to make the proper *exchange, when fruit shortcake is used* the following foods are deducted from the total daily food allowance 1 slice of bread 1 teaspoon of butter and 1 *serving of fruit By a similar process* of exchange, ½ cup of ice cream can be used by subtracting 1 slice of bread and 2 teaspoons of butter from the total daily diet

These and other dessert exchanges are listed and illustrated on the pages that follow, with the intention that with their use the patient will feel that there is less restriction in his diet

* See discussion of sweetening agents page 67

Dessert Exchanges

Certain desserts may be included in the diet provided that the proper food exchanges are made. The following list shows the desserts and their food exchanges.

Desserts	Food Exchanges
Cake	
Angel or sponge $\frac{1}{10}$ of average cake	2 slices of bread
Plain 3"×2"×1¼"	2 slices of bread 1 teaspoon of butter
Cookies, plain 2 3" diameter	1 slice of bread
Custard, 1 serving (½ cup)	1½ slices of bread 1 egg
Fruit gelatin, unsweetened (using 1 serving fruit and ½ cup fruit juice)	2 servings of fruit
Fruit shortcake, 1 serving with 1 heaping tablespoon unsweetened whipped cream	1 serving of fruit 1 slice of bread 1 teaspoon of butter
Ice cream, plain ½ cup	1 slice of bread 2 teaspoons of butter
Plain gelatin (using ½ cup fruit juice)	1 serving of fruit

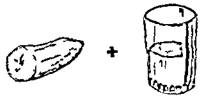
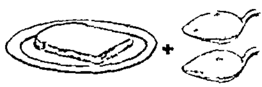
DESSERT EXCHANGES

Each of the following desserts may be used, provided that the proper food *exchanges are made.*

Dessert	Food Exchanges
Cake (angel or sponge)  1/10 average cake	= 2 slices of bread 
Cake (plain) 	= 2 slices of bread + 1 teaspoonful butter 
Cookies  2, 3 diameter	= 1 slice of bread 
Custard 	1½ slices of br

Dessert Exchanges

Each of the following desserts may be used, provided that the proper food exchanges are made

Dessert	Food Exchanges
Gelatin (fruit)  1 serving	= 2 servings of fruit 
Gelatin (plain)  1 serving	= 1 serving of fruit 
Ice cream  ½ cup	= 1 slice of bread + 2 teaspoonsful of butter 
Shortcake  1 serving	= 1 serving of fruit + 1 slice of bread + 1 teaspoonful of butter 

UNRESTRICTED SEASONINGS AND FOODS

Seasonings and food which contain no appreciable amounts of carbohydrate, protein and fat may be used as desired unless their use is restricted by the presence of conditions other than diabetes.

Seasonings
- Allspice
- Angostura bitters
- Anise
- Bay leaf
- Basil
- Caraway seed
- Catsup
- Celery
- Celery salt
- Celery seed
- Chervil
- Chili powder
- Chives
- Cinnamon
- Cloves
- Curry powder
- Dill
- Garlic
- Garlic salt
- Ginger
- Leeks
- Lemon rind
- Mace
- Marjoram
- Mint
- Mustard
- Nutmeg
- Onion juice
- Onion salt
- Orange rind
- Oregano
- Parsley
- Pepper
- Poppy seeds
- Poultry seasoning
- Rosemary
- Saffron
- Sage
- Sauces bottled (without sugar)
- Tabasco
- Tarragon
- Thyme
- Vanilla extract
- Vinegar

Beverages and Soups
- Broth (clear)
- Bouillon
- Coffee
- Consommé
- Dietetic soft drinks (sugar free tonic, or "pop")
- Tea
- Tomato juice
- Tomato soup (clear)
- Vegetable juice
- Water (plain or carbonated)

Miscellaneous
- Gelatin, dietetic or plain
- Pickles, dill or sour
- Sugar substitutes*

* See Sweetening Agents page 67

CALCULATION OF THE DIABETIC DIET

The calculation of the diet is not complicated and with the use of simple arithmetic should be accomplished without difficulty. The amounts of the carbohydrate, the protein and the fat in the various foods in the diet can be obtained from the lists of food exchanges or the illustration sheets. Then these totals can be compared with the diet prescription.

Since many foods contain more than one food constituent, the total carbohydrate is computed by adding the carbohydrate shown on the food exchange sheets listing dairy products, bread, soups, fruit, vegetables, special dishes and desserts.

The total protein is figured by adding the amounts of protein shown on the exchange lists of dairy products, group B vegetables, protein foods, special dishes and desserts.

Similarly, the amount of fat contained in dairy products, in protein and fat foods, as well as in special dishes and desserts are added to obtain the total fat intake for the day.

Then, the sums of the total grams of carbohydrate and protein are multiplied by 4, and the sum of the grams of fat is multiplied by 9, to obtain the calories derived from the 3 food constituents. Finally, these results are added to obtain the total number of calories in the diet.

The 2 examples of typical diabetic diets that follow demonstrate the calculation of the diet and also the possibilities offered in selection and combinations of food to fulfill the diet prescription (Tables 6 and 7).

TABLE 6 CALCULATION OF A SAMPLE DIABETIC DIET*

Diet Prescription Carbohydrate — 150 Grams
Protein — 70 Grams
Fat — 70 Grams
Calories — 1,500

Food	Daily Amount	Grams Carbo-hydrate	Protein	Fat
Milk, whole	2 glasses (1 pint)	24	16	20
Cheese, American	1 ounce		8	10
Egg	1		7	5
Meat, fish or poultry	4 ounces		28	20
Butter or other fat	3 teaspoons			15
Fruit	4 servings	40		
Vegetables Group A	Unlimited			
Group B	1 serving	10	2	
Bread	5 slices	75	10	
Tea or Coffee	Unrestricted			
Clear Broth	Unrestricted			
	Totals	149	71	70

Total Carbohydrate	149 grams x 4 calories per gram =	596 calories
Total Protein	71 grams x 4 calories per gram =	284 calories
Total Fat	70 grams x 9 calories per gram =	630 calories
	Total =	1,510 calories

* The figures for the food calculations have been taken from the Food Exchange sheets (pp. 26-53)

TABLE 7 CALCULATION OF A SAMPLE DIABETIC DIET*

Diet prescription	Carbohydrate — 150 Grams			
	Protein — 70 Grams			
	Fat — 70 Grams			
	Calories — 1500			

		Grams		
Food	Daily Amount	Carbo-hydrate	Protein	Fat
Milk, whole	1 glass (8 ounces)	12	8	10
Cheese, American	1 ounce		8	10
Egg	1		7	5
Meat, fish or poultry	5 ounces		35	25
Butter or other fat	4 teaspoons			20
Fruit	5 servings	50		
Vegetables, Group A	Unlimited			
Group B	1 serving	10	2	
Potato	1 small	15	2	
Cereal	1 serving	15	2	
Bread	3 slices	45	6	
Tea or Coffee	Unrestricted			
Clear Broth	Unrestricted			
	Total	147	70	70

Total Carbohydrate	147 grams x 4 calories per gram = 588 calories
Total Protein	70 grams x 4 calories per gram = 280 calories
Total Fat	70 grams x 9 calories per gram = 630 calories
	Total = 1498 calories

* The figures for the food calculations have been taken from the Food Exchange sheets (pp. 76-53)

THE MEAL PLAN

Care is necessary in dividing the total amount of food allowed for the day into meals since the distribution of food throughout the day is as important as the amount consumed The division of the total food allowance into meals and intermediate feedings is dependent upon the treatment and the needs determined by the physician

As a rule when diet alone is required, the total daily food allowance is divided into approximately 3 equal parts spaced from 5 to 6 hours apart There are times when small intermediate feedings are recommended between meals or at bedtime to spread the food intake throughout the day and the evening thus lessen the amount consumed at any one time

When insulin therapy is required intermediate feedings usually are necessary in addition to the 3 regular meals The number and the hours at which these supplementary feedings are needed are set by the physician since they are an important part of the food prescription This subject is discussed in detail in the chapter dealing with insulin on page 87

Generally, the amount of food to be eaten at any one meal and the time of the meal is a matter of adjustment for the individual patient Therefore, the following division of food in the daily diet is only a suggested meal plan This can be rearranged to suit the individual s needs with attention to food habits and particular tastes

SAMPLE MEAL PLAN

Morning Meal

Fruit as listed under Carbohydrate Exchanges (p 38)
Bread, cereal or other foods as listed under Carbohydrate Exchanges (p 30)
Egg, or other foods chosen from the list of Protein Exchanges (p 46)
Butter, cream or other foods as listed under Fat Exchanges (p 50)
Beverage allowed in the diet
(No sugar or concentrated sweets)

Noon and Night Meal

Clear broth, as desired Other soups with regard to their food values (p 34)
Meat, fish, poultry or other foods under Protein Exchanges (p 46)
Vegetables as listed under Carbohydrate Exchanges (p 42)
Bread, cereal, potato or other foods under Carbohydrate Exchanges (p 30)
Butter, cream or other foods as listed under Fat Exchanges (p 50)
Beverage allowed in the diet
Dessert Fruit as listed under Carbohydrate Exchanges (p 38) or dessert as listed under Dessert Exchanges (p 58)
(No sugar or concentrated sweets)

Intermediate Feedings

Dependent upon the individual needs as prescribed by the physician

CONCENTRATED SWEETS

The term "concentrated sweets" refers to foods such as sugar, honey, marmalade, jam, conserve, frosting, candy, Jello and soft drinks such as tonic or pop. These foods contain carbohydrate and little or none of the other food constituents. For this reason they have often been termed one sided foods.

Concentrated sweets, undesirable for many reasons, are not recommended for the diabetic patient. They are absorbed rapidly and might easily disturb the control of the diabetes, as they enter the blood stream quickly. Concentrated sweets replace the more essential foods which are necessary in furnishing adequate mineral and vitamin content to the diet. In addition, it is generally agreed that adjustment to the diabetic diet will result more easily and within a shorter period of time when concerted effort is made to discourage the taste for sweets. When they are omitted there is a lessening of the desire for them.

In addition to concentrated sweets, certain desserts are not to be recommended either. These include such foods as pies and pastries containing large amounts of carbohydrate as well as fat with a correspondingly high caloric content. These are not included in the dessert exchange list and illustration sheets (pp. 59-61) for the reasons stated.

SWEETENING AGENTS

There are available today several commercial sweetening agents made either from saccharin or sodium (or calcium*) cyclamate. These products have no caloric value and are harmless to the body. Sweetening agents can be purchased in tablet, liquid, or granule form which taste quite similar to sugar. For some people they provide needed satisfaction, but for others there is a bitter or metallic after taste, which prevents acceptance of these products. However, for others they provide needed satisfaction. The decision regarding the use of sweetening agents is one which rests with the patient.

However, it should be remembered that the diabetic diet must be followed all one's life and since this is accomplished more easily when the desire for "sweets" disappears, the use of sweetening agents is not encouraged. A familiar example is a person stopping the use of sugar in coffee. At first the coffee is not satisfying but within a short time the individual could not be persuaded to take sugar in his coffee. So it is with the diabetic patient. When he learns early to do without sweet flavor in foods and beverages, he will come to enjoy unsweetened foods and as a matter of fact might even develop a distaste for sweets.

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* For use in diets restricted in sodium.

DIETETIC FOODS

Many grocery stores assign shelf space for "dietetic" or "special" foods. Although these products are not essential for the diabetic diet there are some which help in varying the diet such as water packed fruit and gelatin, or prepared pudding mixes to which artificial sweetening has been added.

Special diabetic foods such as breads, crackers, cereals and cereal products need not be used, for although the content of carbohydrate is fairly low in many of these, the protein is often increased. Since about 60% of the protein is converted into sugar in the body there really is little advantage, if any in their use. "Protein bread" and "Special formula bread" are examples of such products. It should be noted that toasting removes moisture but actually does not change the carbohydrate content of bread.

Special "nonfattening" oils, mayonnaise and salad dressings are often made with mineral oil. These are not recommended as mineral oil is completely indigestible and, in addition, when used in appreciable amounts tends to interfere with proper absorption in the body of certain vitamins.

Gelatin prepared with saccharin and artificial flavoring has little food value and therefore may be used as desired. Commercial preparations are available.

In many instances, the cost of "dietetic" or "special" foods is more than that of similar regular products. The decision concerning their purchase rests with the patient.

Separating facts from fallacies is a necessity and a responsibility of the diabetic patient if he is to avoid trouble. False claims and food faddism reach into every home through advertising, door-to-door salesmen, magazine articles and lectures. Unless a person is forewarned and forearmed he may become a prey to this misleading information.

The Food and Drug Administration has been seriously concerned with this problem and has done much to prosecute violation of food and drug laws. Still new products appear on the market which either directly or by inference claim to be of value in preventing or curing a disease. In reality they are most ineffective for this purpose and may be considered dangerous when one neglects proper medical treatment in the hope that through some "capsule" or the like one will find a cure. A recent survey by the American Diabetes Association indicates that there are more than 100 food fads and fantasies in circulation today. Therefore, it is an unwise patient who takes chances with his diabetes by trying anything which has not been approved by his physician.

Food faddism presents an equally warning picture since it is difficult for the layman to differentiate between the truth and the half truth in regard to food practices. Advertising with such phrases as "no sugar added," "no fat added," "low calorie," "dietetic," and various others require careful scrutinizing and evaluation by the patient. For example, a bread which is labeled "no sugar added" has little advantage, if any, over the standard breads since all breads are made of some flour and

therefore contain carbohydrate regardless of whether sugar (or fat) has been used in the preparation

Sugar comes in many forms Sucrose is the granulated sugar familiar to all. The public has often been fooled by products misbranded 'no sugar added" by which they mean, 'no sucrose added' and a closer look at the finer print will disclose that other sugars such as honey or molasses or dextrose have been used

Special dietetic candies are another example of labeling which can be open to misinterpretation It may be rightly labeled as containing no sugar, yet it does contain fat, skim milk powder and other ingredients which contain calories and should not be added to restricted diets

Space does not permit a complete dissertation on the volume of products which come under the heading of being "misleading" The diabetic patient is urged to seek authoritative information from his physician, such organizations as the American Diabetes Association* and the American Medical Association,† who will send instructive material upon request, and Government agencies such as the Food and Drug Administration There is still no question that the best way to obtain the essential food constituents in the diet is through the use of the protective foods—milk, eggs, meat, fish, poultry, fruits, vegetables and enriched or whole grain breads and cereals

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* American Diabetes Association Inc., 1 East 45th Street New York 17, N Y

† American Medical Association 535 North Dearborn Street, Chicago 10 Illinois

Drinks containing alcohol should not be taken without permission from the physician

The objectives of diabetic treatment today, upon which most authorities agree are the comfort and the contentment of the patient as well as the control of the disease Alcoholic beverages always have been associated with tradition and hospitality irrespective of nationality, social status and economic level As it is the custom for the French and the Italians to take wine with meals, other national religious groups use wine or other alcoholic beverages when celebrating their holidays or observing their Holy Day traditions

The use of alcoholic drinks by the person with diabetes requires careful consideration for several reasons Alcohol is absorbed very rapidly in the body and each cubic centimeter of pure alcohol furnishes 7 calories This source of quick energy not only spares the utilization of food but adds to the total caloric intake as well

Alcoholic beverages especially when taken in excess can easily weaken one's self-control and produce serious consequences The diabetic control might be disrupted with excessive intake of food On the other hand insulin reactions might be precipitated by the delay or the omission of a meal These might not be readily recognized by the patient or could be mistaken for intoxication In either situation there is a possibility that necessary treatment might not be instituted with serious complications resulting The patient with diabetes should not drink alone or in excess and should not substitute alcoholic drinks for food

Alcoholic beverages can be classified in 2 groups One contains no carbohydrate and the other contains carbohydrate in addition to the alcoholic content The first group includes whiskeys (bourbon Irish rye and Scotch) gin, rum, certain brandies with no sugar content and dry wines Carbohydrate is contained in varying amounts in liqueurs wines (not dry) malt liquors (such as beer and ale), in cider and in certain mixed drinks

The energy and food values supplied by alcoholic beverages must be figured when used by the diabetic patient (see Appendix p 219)

Although it would be wise for the diabetic patient to refrain from the use of alcoholic drinks, there probably would be little objection to one "before dinner drink" when taken at home or when attending a dinner or social function with family or friends who know about his diabetic condition *There should be no drinking under any other circumstances*

The final decision concerning use of alcoholic drinks rests with the physician after careful consideration of his patient.

The diabetic diet can be adjusted to meet the dietary needs of other associated conditions All diet adjustments must fulfill the diabetic food prescription, but the kinds and the amounts *of the foods can be so modified as to* be suitable for both the diabetes and the coexistent condition

On the following pages are included suggestions for altering the sample diabetic diet to meet the requirements of certain conditions It will be noted that the amounts of carbohydrate, protein and fat still meet the same dietary prescription in the sample adult diabetic diet (p 22) In some cases foods have been exchanged for other kinds having equal value In other instances the diets have been modified in texture, *sodium content or amount*

The variations of the diabetic diet that have been included are as follows Sodium Restricted Diets (500 and 1,000 milligrams sodium), Bland Diet, Low Residue Diet, Full Liquid Diet and a discussion of the diet where there are food intolerances

DIABETIC DIET ADJUSTED FOR SODIUM RESTRICTION

When a mild restriction of sodium is required, it may be necessary to omit only the use of salt at the table and in the preparation of food When the sodium prescription in the diet is markedly reduced, certain foods that contain large amounts of sodium either must be restricted or eliminated There are available a number of salt substitutes which can be used (with the physician s permission) to flavor food and make it more palatable

Two sample diets are presented on the following pages together with lists of food restrictions One of these contains 1,000 milligrams of sodium, and the other contains 500 milligrams of sodium There may need to be further modification of these diets dependent upon the diet prescription This is always determined by the physician

DIETS FOR DIABETES AND OTHER CONDITIONS

The diabetic diet can be adjusted to meet the dietary needs of other associated conditions All diet adjustments must fulfill the diabetic food prescription, but the kinds and the amounts of the foods can be so modified as to be suitable for both the diabetes and the coexistent condition

On the following pages are included suggestions for altering the sample diabetic diet to meet the requirements of certain conditions It will be noted that the amounts of carbohydrate, protein and fat still meet the same dietary prescription in the sample adult diabetic diet (p 22) In some cases foods have been exchanged for other kinds having equal value In other instances the diets have been modified in texture, sodium content or amount

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Two sample diets are presented on the following pages together with lists of food restrictions One of these contains 1,000 milligrams of sodium, and the other contains 500 milligrams of sodium There may need to be further modification of these diets, dependent upon the diet prescription This is always determined by the physician

DIABETIC DIET ADJUSTED FOR SODIUM RESTRICTION

TABLE 8 SAMPLE DIABETIC DIET CONTAINING 1,000 MILLIGRAMS OF SODIUM

Food	Daily Amount	Modifications of Foods Allowed	Grams: Carbohydrate	Grams: Protein	Grams: Fat	Milligrams: Sodium
Milk, whole‡	2 glasses (½ pint)	Regular, homogenized or family, evaporated, dried or skimmed	24	16	20	240
Egg	1	Cooked without salt		7	5	65
Meat fish or poultry	5 ounces	Fresh meat such as beef, lamb, veal, liver or fresh fish, fresh or frozen poultry (see p 75 for restrictions)		35	25	125
Butter, sweet	4 teaspoons	Oil or low sodium margarine may be exchanged for sweet butter			20	4
Fruit	4 servings	Fresh, frozen or dietetic canned (see p 75 for restrictions)	40		..	4
Vegetables						
Group A	Unlimited	Fresh, frozen or dietetic			.	10
Group B	1 serving	canned such as asparagus, green or wax beans, cabbage, cauliflower, tomato lettuce, squash, and others (see p 75 for restrictions)	10	2	.	10
Potato, rice or macaroni	1 small serving	Cooked without salt	15	2		5
Cereal	1 serving (see p 31 for size of servings)	Puffed wheat puffed rice, shredded wheat, shredded ralston muffets, or low sodium cornflakes and other available low sodium cereals Also most cooked cereals (see p 75 for restrictions)	15	2	.	2
Bread, regular	3 slices	Crackers (except saltines) and rolls may be exchanged for regular bread (see p 31 for size of serving)	45	6	.	510
Tea or Coffee	As desired	Prepared without salt				
		Totals	149	70	70	975
		Total Calories		1,576		

RESTRICTIONS IN THE LOW SODIUM DIET CONTAINING 1,000 MILLIGRAMS OF SODIUM*

ALL PRODUCTS CONTAINING ADDED SALT OR SODIUM, BAKING POWDER† OR SODA

READ ALL LABELS ON CANNED, FROZEN OR PACKAGED FOODS

Cheese	All cheese and cheese spreads except those which are especially marked low sodium‡
Meat, fish	Salted or smoked meats such as ham, bacon, bologna, tongue, sausage, frankforts, dried beef, corned beef and canned meats. Meat extracts such as broth, consomme, gravy, bouillon cubes and meat tenderizers. Fish salted or smoked, frozen fish fillet, shellfish and canned fish except those marked "no salt added"
Fats	Salted butter, margarine, mayonnaise, salt pork, bacon fat and peanut butter
Fruits	Fruit to which sodium ascorbate, sodium benzoate or sodium sulfite have been added. This can be determined by reading the label
Vegetables	Canned vegetables (except low sodium canned), frozen peas and Lima beans, artichoke, beet greens, carrots, celery, chard, dandelion greens, kale, mustard greens, spinach, white turnip and sauerkraut.
Bread	No more than the number of slices allowed on the diet
Crackers	Crackers which have salt sprinkled on top such as saltines
Cereals	Most ready-to-serve cereals except puffed wheat, puffed rice, shredded wheat, muffets or cereals marked as "low sodium" such as low sodium cornflakes
Flour Products	Products made with prepared flour mixes such as pancake mix
Miscellaneous	Salted nuts, pretzels, potato chips, salted popcorn, relishes, pickles, prepared horseradish, prepared mustard, Worcestershire sauce, soy sauce, catsup, chili sauce, olives, celery salt, onion salt, garlic salt, rennet tablets, Dutch process cocoa and malted milk
Salt	Used either at the table or in cooking

* Adapted from *Restrictions on Low Sodium Diet*, Frances Stern Food Clinic, The Boston Dispensary, 1960.

† Low sodium baking powders are available on the market. Labels should be read carefully.

‡ Throughout this book cheese has been suggested as an exchange for milk. However, 1 ounce of cheese contains approximately 200 milligrams of sodium and therefore should be used only when advised by the physician.

DIABETIC DIET ADJUSTED FOR SODIUM RESTRICTION

Table 9 Sample Diabetic Diet Containing 500 Milligrams of Sodium

Food	Daily Amount	Modifications of Foods Allowed	Grams Carbohydrate	Grams Protein	Grams Fat	Milligrams Sodium
Milk whole‡	2 glasses (½ pint)	Regular homogenized or family evaporated dried or skimmed	24	16	20	240
Egg	1	Cooked without salt		7	5	65
Meat fish or poultry	5 ounces	Fresh meat such as beef lamb veal liver or fresh fish fresh or frozen poultry (see p 77 for restrictions)		35	25	125
Butter sweet	*4 teaspoons*	*Oil or low sodium margarine may be exchanged for sweet butter*			*20*	*4*
Fruit	4 servings	Fresh frozen or dietetic canned (see p 77 for restrictions)	40			4
Vegetables						
Group A	Unlimited	Fresh frozen or dietetic				10
Group B	1 serving	canned such as asparagus green or wax bean cabbage cauliflower tomato lettuce squash and others (see p 77 for restrictions)	10	2		10
Potato rice *or macaroni*	1 small *serving*	*Cooked without salt*	15	2		5
Cereal	1 serving (see p 31 for size of servings)	Puffed wheat puffed rice shredded wheat shredded ralston muffets or low sodium cornflakes and other available low sodium cereals Also most cooked cereals (see p 77 for restrictions)	15	2		2
Bread low sodium	3 slices	*Low sodium bread only* Low sodium crackers potato rice macaroni or allowed cereals may be exchanged for low sodium bread (See p 31 for size of servings)	45	6		30
Tea or Coffee	As desired	Prepared without salt				
		Totals	149	0	70	495
		Total Calories		1,5 6		

Restrictions in the Low Sodium Diet Containing 500 Milligrams of Sodium

ALL PRODUCTS CONTAINING ADDED SALT OR SODIUM, BAKING POWDER† OR SODA

READ ALL LABELS ON CANNED, FROZEN OR PACKAGED FOODS

Cheese	All cheese and cheese spreads except those which are especially marked low sodium‡
Meat fish	Salted or smoked meats such as ham bacon bologna tongue sausage frankforts dried beef corned beef and canned meats Meat extracts such as broth consomme gravy bouillon cubes and meat tenderizers Fish salted or smoked frozen fish fillet shellfish and canned fish except those marked no salt added
Fats	Salted butter margarine mayonnaise salt pork bacon fat and peanut butter
Fruits	Fruit to which sodium ascorbate sodium benzoate or sodium sulfite have been added This can be determined by reading the label
Vegetables	Canned vegetables (except low sodium canned) frozen peas and Lima beans artichoke beet greens carrots celery chard dandelion greens kale mustard greens spinach white turnip and sauerkraut.
Bread	All regular bread made with salt
Crackers	All regular crackers made with salt
Cereals	Most ready to serve cereals except puffed wheat puffed rice shredded wheat muffets or cereals marked as low sodium
Flour Products	Products made with prepared flour mixes such as pancake mix
Miscellaneous	Salted nuts pretzels potato chips salted popcorn relishes pickles prepared horseradish prepared mustard Worcestershire sauce soy sauce catsup chili sauce olives celery salt onion salt garlic salt rennet tablets Dutch process cocoa and malted milk
Salt	Used either at the table or in cooking

* Adapted from Restrictions on Low Sodium Diet Frances Stern Food Clinic The Boston Dispensary 1960

† Low sodium baking powders are available on the market Labels should be read carefully

‡ Throughout this book cheese has been suggested as an exchange for milk However 1 ounce of cheese contains approximately 200 milligrams of sodium and therefore should be used only when prescribed by the physician

Table 10 Sample Diabetic and Bland Diet

Food	Daily Amount	Modifications of Foods Allowed	Grams Carbohydrate	Grams Protein	Grams Fat
Milk whole	2 glasses (½ pint)	Regular homogenized or family evaporated dried or skimmed Use at room temperature as beverage on cereal or in cooking	24	16	20
Cheese	1 ounce	Mild *white or yellow cheese such as* American cheddar or cottage (see p 79 for restrictions)		8	10
Egg	1	Baked boiled poached or scrambled in double boiler		7	5
Meat fish or poultry	4 ounces	Tender meats such as beef lamb veal liver white fish such as haddock cod halibut chicken or turkey Boiled broiled or baked (See p 79 for restrictions)		28	20
Butter or margarine	3 teaspoons	Cream cream cheese or oil may be used as an exchange (see p 79 for restrictions)			15
Fruit	3 servings	Diluted orange grapefruit or other strained juices ripe banana canned *pears peaches applesauce or cooked* fruit with skin and seeds removed (see p 79 for restrictions)	30		
Vegetables					
Group A	Unlimited	Tender cooked vegetables such as green beans carrots beets asparagus tips squash and young greens vegetable juices (see p 79 for restrictions)			
Group B	1 serving		10	2	
Bread or exchange	6 servings	White or light rye bread or crackers refined white cereals such as cream of wheat farina cornflakes puffed wheat or rice potato macaroni noodles spaghetti or white rice (see p 79 for restrictions)	90	12	
		Totals	154	73	70
		Total Calories		1,538	

DIABETIC AND BLAND DIET

A bland diet contains most of the foods in the diabetic diet with a few exceptions The foods must be bland, nonirritating and nonstimulating to the digestive tract and neither too hot nor too cold Certain meats fruits vegetables and whole grains are not used since they contain cellulose or roughage which is not usually permitted *Since there are various opinions based on experience with patients of foods to be retained or omitted in the bland diet the following outline is a suggested sample which may be modified by the physician*

Restrictions in the Bland Diet

Milk	Hot or very cold
Cheese	Any cheese or cheese spreads containing spices onion chives pimento pineapple or so-called strong cheeses
Egg	Fried
Meat and fish	Meats containing long fibers smoked or pickled meats such as ham corned beef spiced or prepared meats such as sausage frankforts bologna liverwurst meat broths extractives and gravies
Fats	Seasoned oils such as French dressing mayonnaise salad dressing and nuts
Fruits	Unstrained fruits containing cellulose and seeds—berries melons cherries cranberries dates figs grapes pineapple plums raisins and rhubarb
Vegetables	Broccoli Brussels sprouts cabbage turnip cauliflower celery green and red pepper radishes cucumber okra onions parsnip corn and legumes
Bread	Coarse breads such as those containing bran or seeds
Crackers	Crackers containing bran seeds or those fried in deep fat
Cereals	Cereals containing bran coarse whole grain cereals or whole grain rice
Miscellaneous	Condiments such as pepper mustard catsup relishes pickles horse radish Worcestershire sauce chili sauce many other spices as well as fried foods
Beverages	Coffee sometimes tea carbonated beverages alcoholic beverages cocoa and hot chocolate

DIABETIC AND LOW RESIDUE DIET

TABLE 11 SAMPLE DIABETIC AND LOW RESIDUE DIET

Food	Daily Amount	Modifications of Foods Allowed	Grams		
			Carbohydrate	Protein	Fat
Milk, whole	2 glasses (½ pint)	Regular homogenized or family evaporated dried or skimmed Use at room temperature as beverage, on cereal or in cooking Milk may or may not be boiled	24	16	20
Cheese	1 ounce	Mild white or yellow cheese such as *American cheddar or cottage (see p 81 for restrictions)*		8	10
Egg	1	Baked, boiled poached or scrambled in double boiler	•	7	5
Meat fish or poultry	4 ounces	Ground tender meats such as beef lamb veal liver white fish such as haddock cod halibut chicken or turkey Boiled broiled or baked (see p 81 for restrictions)		28	20
Butter or margarine	3 teaspoons	Cream cream cheese or oil may be used as an exchange (see p 81 for restrictions)	•		15
Fruit	3 servings	Diluted orange grapefruit or other *strained juices ripe banana canned* pears peaches applesauce or cooked fruit with skin and seeds removed (see p 81 for restrictions)	30		
Vegetables					
Group A	Unlimited				
Group B	1 serving	Cooked strained tender vegetables such as green beans carrots beets asparagus tips squash and young greens vegetable juices (see p 81 for restrictions)	10	2	
Bread or exchange	6 servings	*White or light rye bread or crackers* refined white cereals such as cream of wheat farina cornflakes puffed wheat or puffed rice potato macaroni noodles spaghetti or white rice (see p 81 for restrictions)	90	12	
Tea Coffee	As desired				
Consomme or Broth	As desired				
		Totals	154	73	70
		Total Calories		1,538	

DIABETIC AND LOW RESIDUE DIET

The degree of restriction of the low residue diet will depend on the physician since the restriction will depend on the condition for which it is prescribed as well as the particular individual The modification of the sample diabetic diet to meet the requirements of a low residue diet is calculated on the preceding page

Restrictions in the Low Residue Diet

Milk	In certain cases milk may not be allowed on low residue diets
Cheese	Any cheese or cheese spreads containing spices onion chives pimento pineapple or so-called strong cheeses Very low residue diet may require only cottage cheese when tolerated
Egg	Fried
Meat fish or poultry	Meats containing long fibers smoked or pickled meats such as ham corned beef spiced or prepared meats such as sausage frankforts bologna liverwurst meats which have not been ground skin of chicken or turkey
Fats	Peanut butter and nuts
Fruits	All raw fruits except banana and strained juices Fruits with skins, seeds or fiber such as berries melon cherries cranberries dates figs raisins grapes pineapple plums and rhubarb Very low residue diets would limit fruit to citrus juices
Vegetables	All raw unstrained or gas forming vegetables except vegetable juices Broccoli Brussels sprouts cabbage turnip cauliflower celery green or red pepper radishes cucumber okra onions parsnip corn and legumes
Bread	All whole grain bread hot breads and breads containing seeds
Crackers	All whole grain crackers crackers containing seeds or fried in deep fat
Cereals	Whole grain cereals such as whole wheat flakes cooked whole wheat or oat cereals or whole grain rice
Flour Products	Mixes made of whole grain flour such as buckwheat flour or those containing fruits such as blueberry pancake mix
Miscellaneous	All fried foods strong condiments such as pepper mustard catsup relishes pickles horseradish Worcestershire sauce and chili sauce
Beverages	Alcoholic beverages usually not allowed Other beverages dependent upon the condition

DIABETIC AND FULL LIQUID DIET

TABLE 12 SAMPLE DIABETIC AND FULL LIQUID DIET

Food	Daily Amount	Modifications of Foods Allowed	Grams Carbohydrate	Grams Protein	Grams Fat
Milk whole	4 glasses (1 quart)	Regular homogenized or family evaporated dried or skimmed May be used as beverage on cereal or in cooking	48	32	40
Eggs	4	Used in eggnog or as soft custard Homogenized meat such as baby beef veal liver pork or chicken may be exchanged for egg and used in soup		28	20
Butter or Margarine	2 teaspoons	May be used in soup or in cereal Cream may be exchanged for butter			10
Fruit	6 servings	Fruit juices such as orange grape fruit tangerine apple and prune (See p 83 for restrictions)	60		
Vegetables					
Group A	Unlimited	Pureed vegetables such as green			
Group B	1 serving	beans wax beans carrots peas, beets squash asparagus tips and young greens Used as juices or in soups (See p 83 for restrictions)	10	2	
Cereal	2 servings	Refined white cereals such as cream of wheat cream of rice farina and strained oatmeal Used as gruels (See p 83 for restrictions)	30	4	
Tea Coffee Clear Broth or *Consomme*	Unlimited				
		Totals	148	66	70
		Total Calories		1486	

DIABETIC AND FULL LIQUID DIET

The liquid diet is usually a temporary one and is always prescribed by the physician. A full liquid diet contains all the foods in the regular diabetic diet with the exception of meat, fish, poultry, bread and crackers. Occasionally, even meat in the homogenized form will be included in soups. The protein exchanges can be fulfilled by the use of eggs in place of the meat. Fruits can be taken in the form of juice and vegetables can be strained and used in soups. The foods in the bread group can be exchanged for cereals in the form of gruels. The diabetic and full liquid diet is shown on the preceding page.

Restrictions in the Full Liquid Diet

Cheese	All cheese
Meat fish or poultry	All meat, fish or poultry which cannot be finely homogenized and combined with bouillon broth or served in soups
Egg	Boiled, scrambled, poached or baked
Fruits	Whole fruits of any kind
Vegetables	Uncooked or cooked whole vegetables.
Bread	All breads, potato (except as soup), macaroni products, rice and crackers
Cereals	Dry cereals and unstrained, cooked whole grain cereal

FOOD INTOLERANCES

The patient may be sensitive to one or more foods which appear on the diabetic diet list Sensitivity to a single food should not present any problem, since the lists of food exchanges offer many possibilities for substitution However, when there is an intolerance involving a large group of foods such as all fruits, or many protein foods such as milk, cheese and egg, there may need to be a careful evaluation of the diet with the physician



SIR FREDERICK GRANT BAN
1891–1941

Born in Canada and educated at the Ur
of Toronto Served in World War I a

1923 Same year received Nobel Prize i
covery of insulin In 1924 Banting R
Foundation was established and in 1930 I
Institute was opened in Toronto Created
of the British Empire in 1934 Elected
of the Royal Society of London 1935 K
airplane accident in Newfoundland in 19

BANTING AND BEST, WHOSE DISCOVERY OF INSULIN GAVE DIABETICS THE CHANCE TO LIVE NORMAL, HAPPY AND USEFUL LIVES

DR CHARLES HERBERT BEST
1899–

Born West Pembroke Maine (parents Canadians) Educated at University of Toronto and University of London Served in World War I and was Director of the Royal Canadian Navy *Medical Research Division during World War* II Appointed Director Department of Physiology University of Toronto in 1929 Director *of Banting and Best Department of Medical* Research in 1941 and in 1953 also appointed Director of the Charles H Best Institute Honorary Degrees received from Universities of Chicago Paris Cambridge Amsterdam Liege Ox*ford, Dalhousie Queens Chile Uruguay San* Marcos (Peru) Melbourne Laval Maine and Venezuela In 1934 was a Vice President of British Diabetic Association in 1948 President of American Diabetes Association and since 1952 *Chairman of the Editorial Board Journal of* Diabetes Honorary Membership American Diabetes Association since 1940 Honorary President International Diabetes Federations since 1949 and Honorary President Canadian Diabetes *Association since 1952 (Ashley and Crip-* Toronto, Can)

3. INSULIN

THE DISCOVERY of insulin in 1921 by Sir Frederick G Banting and Dr Charles H Best was one of the outstanding achievements in medical science Although a detailed account of the pertinent events that preceded and followed this exciting discovery is not intended in the scope of a book such as this, certain endeavors deserve special mention

As early as 1869, a German pathologist and anatomist, Langerhans, described the cells (now called islands of Langerhans) in the pancreas from which insulin is derived During the latter part of the 19th century two German scientists, Minkowski and Von Mering, noted that diabetes could be produced in dogs by the removal of the pancreas This was the first time that diabetes was produced experimentally In the years that followed, many investigators tried without success to use products derived from the pancreas in a search for treatment or a cure for diabetes Then in 1921 Dr Banting and Dr Best uncovered the secret of obtaining insulin from the pancreas The credit for perfecting the insulin for use, by improving the method of its extraction from the pancreas of animals, belongs to Dr Collip, a Canadian chemist

For many years, this insulin preparation was used when diet alone was not sufficient for diabetic control Then, in 1936 Dr H Hagedorn of Denmark and his associates found that by adding a protein (protamine) to insulin, its action could be prolonged for a period of 12 hours as compared with 4 to 6 hours Following this, Scott and Fisher at the University of Toronto discovered that, by adding zinc to the protamine insulin, the resultant preparation protamine zinc insulin, was effective in controlling blood sugar levels for a period of 24 hours or longer For the first time, diabetic control could be achieved in many instances with one injection of insulin daily instead of multiple injections

Although protamine zinc insulin was effective for many there still were patients who required additional injections of regular insulin for adequate diabetic control In 1943, as a result of further study, the first of another group of insulin preparations the so-called intermediate acting insulins was developed

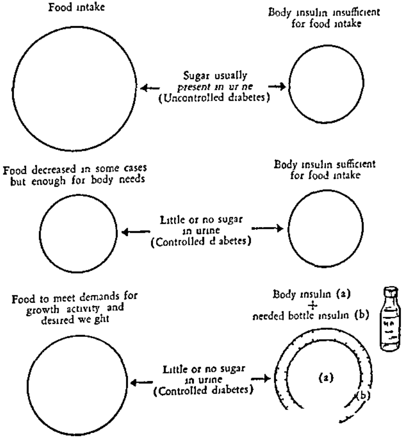
This preparation called globin insulin was followed by two other intermediate acting insulins NPH insulin and lente insulin These insulin preparations, together with rapid acting insulin, (unmodified insulin) and long acting insulin (protamine zinc insulin) now permitted a choice of the preparations best suited to the needs of the individual patient

There is no known substitute for insulin when its use is indicated for treatment Up to the present time there is no form of *insulin* which when taken by mouth is effective in the control of diabetes In the process of digestion, insulin is changed in the stomach by the digestive juices and loses its value in the treatment of diabetes *The patient should be* deeply grateful for the discovery of insulin, as well as encouraged and comforted by the progress that has been made since its discovery

Insulin is required when there is not sufficient insulin secretion in the body to use and store the sugar derived from the prescribed diet The insulin used for this purpose (bottle insulin), is a liquid preparation obtained from the pancreas of animals When taken by injection this insulin acts in much the same manner as body insulin and is an effective and necessary part of treatment when its use is indicated for the control of diabetes (Fig 9)

Insulin therapy when indicated is the most effective means of controlling diabetes in the shortest possible time The amount of insulin required to achieve good diabetic control often will aid in determining the severity of

Interdependence of Diet and Insulin



RE 9

the diabetes and may give a clue as to whether or not oral drugs can be used successfully at a later date (Chap 5, Oral Drugs)

Usually children require insulin therapy This is most often the case with adolescents and young adults In sulin is also required by a large per centage of adult patients, especially when more liberal diets are necessary to maintain or attain desired weight Often, when diabetes develops during middle life or later the need for in sulin therapy or oral drugs depends upon the patient s adherence to the prescribed diet as well as upon the se verity of the diabetes

Even though the patient will be able *to use an oral drug with success at a* later date, *whenever possible the pa tient whose diabetes cannot be con trolled with diet alone should have the technical knowledge and equipment necessary for the injection of insulin* Occasions may arise when temporary insulin therapy is required without delay, such as during the course of in fections or other complications Then too there may be times when oral drugs are no longer as effective as de sired and insulin therapy needs to be resumed

In certain selected cases due to ex tenuating circumstances, the insulin injection procedure may not be feasi ble The patient may have physical dis abilities such as poor eyesight or ar thritis, and there may be no available family members or friends to assume the responsibility for the daily insulin injection Under such conditions, the use of an oral drug may be prescribed at the outset of treatment, provided that the physician considers the patient to be suitable for this type of therapy

The kind and the amount of insulin to be used is always determined and prescribed by the physician

There have been great advances in the development of insulin prepara tions since insulin was first discov ered in 1921 Not only have these prep arations facilitated the treatment for both patient and physician, but also they have been the means of achieving better diabetic control during the 24 hour period and often with fewer daily injections All insulin prepara tions are derived from the pancreas of animals chiefly the cow and the hog The potency and the stability of these preparations have been determined carefully by approved methods and conform to standards that are estab lished and accepted throughout the world

An adequate supply of insulin should always be available so that the pre scribed daily amount is assured It is wise also to have an extra syringe and needles available The bottle of insulin should be discarded when there are signs of discoloration or deterioration of the contents An expiration date is stated on every bottle and this should be checked so that insulin is not used after the stated date Insulin should be kept in a cool place preferably a re frigerator However when desired for convenience the bottle that is in use may be kept safely at room tempera ture Extra supplies of insulin that are kept in reserve require refrigeration Temperatures, heat and cold, that are

too extreme should be avoided, and the bottle of insulin needs to be protected from strong light

All insulin preparations, other than unmodified insulin or regular and globin insulin, must be mixed thoroughly just before use Vigorous shaking of the bottle is to be avoided A thoroughly mixed solution is accomplished by rotating the bottle in the palms of the hands and inverting the bottle from end to end These procedures need to be repeated several times to ensure uniform and constant proportions of the ingredients with each injection (see Procedure for Injection of Insulin, p 106) Failure to mix insulin solutions correctly can result in irregularity of the effects of the individual doses

KINDS OF INSULIN PREPARATIONS

There are several insulin preparations The kind of insulin selected by the physician is intended to meet the special needs of the individual and should not be changed by the patient, unless recommended by the physician

At the present time the following kinds of insulin are available insulin (unmodified insulin or regular insulin), protamine zinc insulin (frequently referred to as protamine insulin), globin insulin, NPH insulin and lente insulin, two additional types of which are semilente insulin and ultralente insulin A description of the various insulin preparations follows

Insulin

Insulin commonly referred to as unmodified insulin or regular insulin, is a water-clear solution made from zinc insulin crystals and is contained in a round bottle The action is rapid, and its effect is of short duration last ing from about 6 to 8 hours The great est blood sugar lowering effect occurs about 2 to 3 hours after the injection

Often insulin is used in conjunction with slow or intermediate acting insulin in the form of a mixture (p 128), or separate injections are pre scribed so that better control can be accomplished Insulin is used also in emergencies such as in the treatment of diabetic acidosis and coma Often it is used alone or in combination with other insulin preparations during the course of infections, surgery or other acute conditions

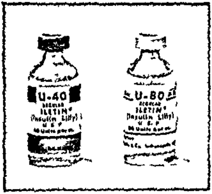


PLATE 1 Insulin (unmodified insulin or regular insulin) for rapid effect (Eli Lilly & Co)

Protamine Zinc Insulin

Protamine zinc insulin, commonly referred to as protamine insulin, has a cloudy, milky appearance after it has been mixed. It is contained in a round bottle. In addition to insulin, this preparation contains zinc and a protein substance (protamine) which causes it to be absorbed more slowly than regular insulin from the site of injection. The blood sugar lowering effect lasts for as long as 48 hours, and the greatest effect usually occurs from about 12 to 24 hours after the injection.

Usually, one daily injection of protamine zinc insulin is sufficient to control most mild or moderately severe diabetes. However, in some instances insulin in addition to protamine zinc insulin is needed to obtain adequate diabetic control. This is accomplished either by means of separate injections of insulin or with the use of insulin mixtures. For these mixtures, a larger amount of insulin than protamine zinc insulin is used. The proportion prescribed most often is 1 part of protamine zinc insulin to 2 parts of insulin (see Insulin Mixtures, p. 128).

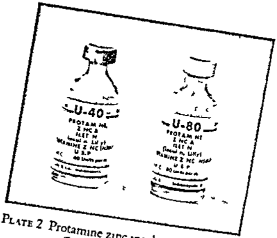


PLATE 2. Protamine zinc insulin for prolonged effect. (Eli Lilly & Co.)

In 1936 when protamine zinc insulin was first used, the treatment of diabetes was greatly facilitated Many patients who previously had required several injections of insulin each day were able to obtain good diabetic control with only one daily injection However, while the use of protamine zinc insulin resulted in a tremendous advance in treatment it still did not serve as an ideal preparation for many patients with moderately severe or severe diabetes With this group insulin was needed in addition to protamine zinc insulin to obtain the diabetic control desired

Insulin was taken by separate injections to augment the action of the protamine zinc insulin or mixtures of protamine zinc insulin and insulin were devised to attain better diabetic control The technique essential for the preparation of insulin mixtures was rather difficult and required careful instruction to prevent possible errors either in the measurement of the insulins or in the preparation of the mixtures in the syringe

Often, too it was difficult to obtain the exact blood sugar lowering effect throughout the day and the night without upsetting the patient s mode of living Rather than readjust this to fit the action of insulin an attempt was made to produce an insulin preparation to meet the usual needs of the patient

Thus, the introduction of intermediate acting insulins followed much study and research The first of these was globin insulin and later NPH insulin and lente insulin With the use of intermediate acting insulins it was possible with few exceptions to prescribe the kind of insulin best suited to the individual patient and thereby maintain the blood sugar levels desired throughout the 24 hour period Also when more rapid action was needed insulin could be added to NPH insulin or lente insulin in the same syringe, without significantly changing the individual actions of each preparation A description of the intermediate acting insulins follows

Globin Insulin

Globin insulin is a clear amber-colored solution contained in a round bottle. In addition to insulin this preparation contains globin and zinc. The action of globin insulin lasts up to 24 hours and the greatest blood sugar lowering effect occurs about 8 to 12 hours after the injection.



PLATE 3 Globin Insulin for intermediate effect. (Burroughs Wellcome & Co. Inc.)

NPH Insulin

NPH insulin has a cloudy, milky appearance and is contained in square shaped bottles with blue labels This insulin consists of a suspension of crystals of insulin together with protamine and zinc It is necessary that this preparation be mixed thoroughly before it is withdrawn from the bottle so that the proportions of the ingredients are the same for each insulin injection The blood sugar lowering effect of NPH insulin usually lasts longer than 24 hours and its greatest effect occurs about 8 to 12 hours after the injection

NPH insulin meets the needs of a large percentage of diabetic patients

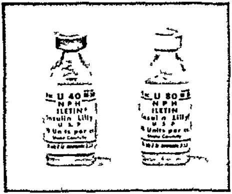


PLATE 4 NPH insulin for intermediate effect (Eli Lilly & Co)

Lente Insulin

Lente insulin is a cloudy milky appearing solution contained in a round bottle with 6-sided shoulders (Hexanek) A large L in black print is superimposed on the colored printing on the label The action of this preparation is very similar to that of NPH insulin the difference being in the ingredients Lente insulin contains only insulin and zinc As with NPH insulin the blood sugar lowering effect usually lasts from 28 to 30 hours and the greatest effect occurs about 8 to 12 hours after the injection

Lente insulin and NPH insulin are similar in action Both have been found to suit the needs of a large percentage of patients

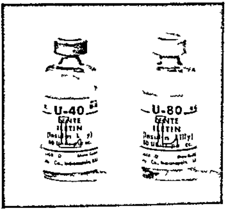


PLATE 5 Lente insulin for intermediate effect (Eli Lilly & Co)

There are two additional lente insulin preparations, one named semilente insulin and the other ultralente insulin. These are seldom used alone. When there is indication for their use they are added to the lente insulin in the form of a mixture. The preparation of the mixtures of lente insulin with either semilente or ultralente insulin is discussed and illustrated on page 128, Insulin Mixtures.

Semilente Insulin

Semilente insulin is a cloudy, milky appearing solution contained in a round bottle with 6-sided shoulders (Hexanek). A large "S" in black print is superimposed on the colored printing of the label. The action of semilente insulin is relatively short and rapid, and the total duration of the effect is similar to that of insulin. Semilente insulin is particularly useful in speeding the action of lente insulin when the two are combined. The mixtures of these two preparations is indicated when better after meal control of the diabetes is needed.

Ultralente

Ultralente insulin is a cloudy, milky appearing solution contained in a round bottle with 6-sided shoulders (Hexanek). A large "U" in black print is superimposed on the colored printing of the label. The action of ultralente insulin is slower and longer than that of lente insulin and closely resembles the action of protamine zinc insulin. Its greatest advantage concerns its use in the form of a mixture with lente insulin for patients who require further diabetic control in the early morning fasting condition.

TABLE 13 THE VARIOUS KINDS OF INSULIN PREPARATIONS, SHAPE OF THE BOTTLE, COLOR OF THE SOLUTION, DURATION OF THE BLOOD-SUGAR LOWERING EFFECT AND THE TIME OF GREATEST EFFECT

KINDS OF INSULIN PREPARATIONS	SHAPE OF THE BOTTLE	COLOR OF THE SOLUTION	DURATION OF THE BLOOD-SUGAR LOWERING EFFECT	TIME OF GREATEST EFFECT
Insulin (unmodified or regular)	Round	Clear	6 to 8 hours	2 to 3 hours
Protamine Zinc Insulin	Round	Cloudy milky	As long as 48 hours	12 to 24 hours
Globin Insulin	Round	Clear amber	17 to 24 hours	8 to 16 hours
NPH Insulin	Square	Cloudy milky	28 to 30 hours	8 to 12 hours
Lente Insulin	Round with 6-sided shoulder	Cloudy milky	28 to 30 hours	8 to 12 hours

DIVISION OF FOOD IN THE DIET WITH INSULIN THERAPY

The division of food in the diet needs careful consideration, especially when insulin therapy is required The food intake should be arranged in meals so as to provide a fairly equal distribution of carbohydrate, protein and fat throughout the day In addition to the morning, noon and night meals intermediate feedings should be planned with regard to the insulin preparation that is prescribed The division of daily food spaced more evenly over a longer period of time facilitates its usefulness and effectiveness Furthermore, the possibility of insulin reaction is minimized (p 137)

Usually, it is recommended that the meals be spaced from about 5 to 6 hours apart The number of intermediate feedings and the times at which they are to be taken are dependent not only upon the kind of insulin used but also upon the needs of the individual patient The particular requirements of the patient are always determined by the physician The following discussion concerning meals and intermediate feedings therefore, contains over all general statements

Rapid-Acting Insulin

Insulin (Unmodified Insulin or Regular Insulin)

When only unmodified insulin is used, the patient should have 3 meals during the day, spaced from 5 to 6 hours apart The division of the total food for the day is suggested in THE MEAL PLAN, page 66

Long Acting Insulin

Protamine Zinc Insulin

When protamine zinc insulin is used, *in addition to the 3 meals, spaced* from 5 to 6 hours apart, there should be included a luncheon or feeding before bedtime Often a small midmorning and/or midafternoon feeding is recommended as well These feedings, especially the one before bedtime, are *most important* in preventing insulin reactions (p 137)

While the midmorning and midafternoon feedings can be made up of simply a serving of fruit or a glass of milk, the feeding before bedtime should contain foods that will be absorbed over a longer period of time These feedings can consist of milk and bread, crackers or cereal, or tea or coffee and cheese with bread or crackers, or fruit, cereal and milk or similar combinations of carbohydrate, protein and fat

When intermediate acting insulins are used, in addition to the 3 meals, spaced from 5 to 6 hours apart, there should be included a luncheon or feeding in the midafternoon Often, when indicated, a small midmorning and/or before bedtime feeding is recommended as well These feedings, especially the midafternoon feeding, are important in the prevention of insulin reactions (p 137).

While the midmorning and bedtime feedings can consist of a serving of fruit or a glass of milk, the midafternoon feeding should be somewhat larger Milk and bread crackers or cereal, or tea or coffee and cheese with bread or crackers or fruit, cereal, and milk, or similar combinations of foods are usually recommended

When more than 1 cc of U 80 insulin is required, the Official Insulin Syringe containing 2 cc should be used This long type syringe is marked in a single green scale (Fig 12)

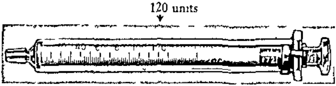


Fig 12 Official Insulin Syringe—2 cc long type

The 2 cc syringe for U 80 insulin showing how 120 units of insulin can be measured (single green scale) (Becton, Dickinson & Co)

THE 1 0 cc SYRINGE

The second type of syringe, frequently used contains 1 cc and is marked off into 10 equal parts, each division representing 1/10 of a cubic centimeter (Fig 13)

The following figure illustrates the

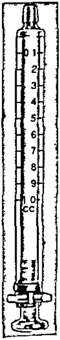


Fig 13 Diagram of 1 0 cc syringe (Becton Dickinson & Co)

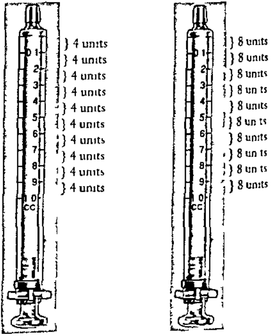
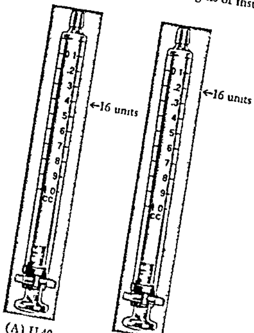


Fig 14 The number of insulin units of different strengths ... l be contained in each division of the 1 ... when filled with U-40 and U 80 ins... Dickinson & Co)

number of insulin units of different strengths that would be contained in each division of the 1 0-cc syringe when filled with U-40 and U 80 insulins

For example, if 16 units of insulin were prescribed, Figure 15 shows how to measure the same number of units in a 1 0-cc syringe with the different strengths of insulin preparations



(A) U-40

(B) U 80

Fig 15 Diagram showing how the same number of units can be measured in a 1 0-cc syringe with the different strengths of insulin solutions Syringe A is filled to 0 4 cc and has 16 units of insulin (4 times 4) Syringe B is filled to 0 2 cc and has 16 units of insulin (8 times 2) (Becton, Dickinson & Co)

OTHER SYRINGES FOR INSULIN

There are other syringes which have marked on them one or more scales of figures to measure either the amount or the number of units of insulin It is most important for the patient to know the meanings of the markings and the figures on the syringe he uses to be sure that the insulin measured corresponds to the amount prescribed When in doubt concerning the measurement of insulin, the physician should be consulted to make certain that the insulin is measured correctly

THE AUTOMATIC INJECTOR

There are available automatic injectors which may be preferred by the patient and recommended by the physician The patient should be as thoroughly familiar with the correct technic when using an automatic injector as with other methods of insulin administration

The syringe is filled with the correct amount of insulin, following the procedures on page 106 Then the needle is inserted into the skin automatically, according to the instructions The plunger is pushed down to inject the insulin

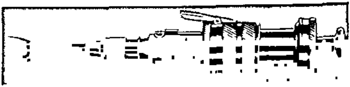


FIG 16 Diagram of the Busher automatic injector. (Becton Dickinson & Co)

THE HYPODERMIC NEEDLE FOR THE INJECTION OF INSULIN

A number of suitable brands of hypodermic needles are available for the injection of insulin These are made of stainless steel which does not rust and requires a minimum of care The needles that are recommended and commonly used are ⅜, ½ or ⅝ inches in length, and they can be either 25 or 26 gauge

Wires are provided that can be used for cleaning the bores and also may b[e] inserted in the needles when they are not in use. The point of the needle must always be protected (see Injection of Insulin, p 106) and when the needle has a dull or rough point it should be discarded It is advisable to keep a reserve supply so that the insulin injection is not delayed through any mishap to the only needle

INJECTION KITS

There are kits which contain the equipment necessary for the insulin injection These have been designed to hold the insulin bottle, the syringe, the needles, as well as cotton and alcohol needed for sterilization These kits are especially convenient when traveling or for use at home when facilities are limited

PROCEDURE FOR INJECTION OF INSULIN

The correct method of the injection of insulin should be understood At first, this procedure requires a great deal of care, since there are many details that must be known However, once familiar with the steps for injection of insulin, the procedure is done with ease and becomes a matter of routine

1 *A tray set up with the necessary equipment* should be kept in a handy place ready for use The tray and the various articles should be clean at all times The articles necessary for the injection of insulin are bottle of insulin, bottle of alcohol, dish to hold alcohol, clean absorbent cotton in a covered container and the needle and the syringe in their box (Fig 17)

2 *Cleanliness* is a rule of prime importance from the first to the last step of the procedure for the injection of insulin and must not be overlooked In preparation, the hands should be washed carefully with mild soap and warm water and should be dried with a clean towel (Fig 18)

3 *Alcohol* is used to sterilize* the necessary articles for the injection of insulin Articles requiring sterilization are the top of the bottle of insulin † the needle and the syringe The skin where the injection is to be made must also be sterilized with absorbent cotton dipped in alcohol The alcohol is poured into a clean dish for this purpose (Fig 19)

4 *It is necessary that the contents of the bottles of protamine zinc insulin NPH insulin and lente insulin be well mixed before using* This is done by rolling the bottle between the palms of the hands, but not shaking it since by so doing the insulin would foam This procedure is not necessary for other kinds of insulin (Fig 20)

5 *The whole top of the bottle of insulin is sterilized* by dipping it in the dish of alcohol This must always be done before inserting the needle in the stopper The rubber stopper in the insulin bottle never should be removed because it keeps the insulin sterile (Fig 21)

6 *It is well to keep a wire in the needle* to prevent it from becoming plugged The wire should always be removed from the needle before it is sterilized (Fig 22)

7 *The needle* should be placed carefully in the alcohol* so that the point will not be blunted by hitting the dish Dull needles should not be used since they may injure the skin The needle should remain in the alcohol until ready to be placed on the syringe (Fig 23)

8 *The syringe for the injection of insulin* consists of a barrel which is like a cylinder or a tube, and a plunger, which is a glass rod that fits into the barrel (Fig 24)

* Medicated rubbing 70 per cent ethyl alcohol or isopropyl alcohol may be used Denatured alcohol should not be used

† Each insulin bottle has a protective aluminum seal The directions for removing this seal are found on the instruction pamphlet contained in the insulin package

* 25 gauge or 26 gauge ⅜ ½ or ⅝ inch needle preferably stainless steel

9 *The syringe is put together for* the injection of insulin by inserting the plunger in the barrel The plunger (glass rod) should fit snugly into the barrel of the syringe so that there is no leakage of insulin (Fig 25)

10 *The syringe is then sterilized with alcohol* This is accomplished by placing the end of the syringe in the dish of alcohol and drawing up the plunger to fill the syringe with the alcohol and then pushing the plunger down to empty it This should be repeated 3 or 4 times (Fig 26)

11 *The needle is placed firmly on the syringe* by twisting it to make it secure The needle is held by the hub to keep the point sterile since it should not be touched by the hands or come in contact with any object (Fig 27)

12 *The syringe and the needle must be completely emptied of all alcohol* This is done by pulling the plunger up and down several times until the syringe and the needle are thoroughly dry (Fig 28)

13 *It is necessary to replace with the same amount of air the amount of insulin to be withdrawn from the bottle* The syringe is filled with air by drawing the plunger as far as the figure that measures the amount of insulin that has been prescribed (Fig 29)

14 *The air in the syringe is forced into the bottle* by inserting the needle through the center of the stopper of the insulin bottle The syringe should be held near the needle and in a straight line with the insulin bottle so that the needle will not become bent as it is pushed through the stopper (Fig 30)

15 *Air is forced into the bottle* by pushing the plunger of the syringe as far as it will go When the air is not forced into the insulin bottle to replace the insulin to be withdrawn from it a vacuum is created in the bottle A vacuum in the bottle makes it difficult to pull the plunger when measuring insulin because the plunger is sucked back as it is pulled (Fig 31)

16 *The syringe is filled with insulin* by drawing the plunger as far as the figure that measures the amount of insulin prescribed One hand is used to hold both the insulin bottle and syringe allowing the other hand to be free to pull the plunger The bottle of insulin is turned upside down so that the insulin is immediately over the stopper To prevent bending the needle the insulin bottle and the syringe should be kept in a straight line Care should be taken to have no air in the syringe since it would take up space intended for insulin If there is air in the syringe it will appear as a bubble in the insulin Whenever an air bubble appears the plunger should be pushed to force the air back into the bottle of insulin and then pulled out again (Fig 32)

17 *The needle is withdrawn from the bottle* (Fig 33)

18 *The syringe which is now filled with insulin should be put down carefully* so that the needle on the syringe does not touch the hand or any object The cover of the syringe box with its cutouts is a good resting place for the

syringe until the skin is sterilized for the injection of insulin (Fig 34)

19 *The place of injection is changed with each injection of insulin* First one leg or arm is used, and then the other The abdomen may also be used A place where an injection has been made should not be used again for months (Fig 35)

20 *A small piece of absorbent cotton is dipped in the dish of alcohol* (Fig 36)

21 *The skin is sterilized at the place of injection* by rubbing it gently with the cotton that has been soaked with alcohol (Fig 37)

22 *The cotton may be placed back in the dish of alcohol or rested on the leg* where it is ready to use again after the insulin has been injected (Fig 38)

23 (A) *The left hand is used to pinch a large amount of flesh,* the center of which is to be used for the injection With the flesh thus held firmly, the needle can be injected more easily (Fig 39) (B) *The skin can be stretched* between the thumb and the first (index) finger when one is unable to pinch a large amount of flesh (Fig 40)

24 *The needle is injected at a right angle (straight not slanted) to the leg* The syringe is held as one would hold a pencil, between the thumb and the index finger of the right hand, and the needle is pushed firmly for its entire length into the skin Once the needle is injected into the skin it is not necessary to hold the flesh With the left hand, pull the plunger of the syringe back gently, and if blood is drawn into the syringe, withdraw the needle and insert it elsewhere (Fig 41)

25 *The right hand is used to hold the syringe steady while the left hand holds the syringe at the top, between the index and the middle fingers* and the thumb pushes the plunger to inject the insulin (Fig 42)

26 *The needle is withdrawn quickly with the right hand* At the same time, the left hand, with the cotton that has been dipped in alcohol, presses the cotton firmly over the place of injection so that the needle will not pull the skin as it is withdrawn (Fig 43)

27 *The skin is then sterilized* at the place of injection by rubbing it gently with the cotton that has been soaked with alcohol (Fig 44)

28 *The needle is placed in the dish of alcohol* to keep it from becoming plugged The needle should be placed carefully in the alcohol so that the point will not be blunted by hitting the dish (Fig 45)

29 *The syringe is washed in alcohol* to prevent the plunger and the barrel from sticking This is accomplished by placing the end of the syringe in the dish of alcohol and drawing up the plunger to fill the syringe with alcohol and then pushing the plunger down to empty it (Fig 46)

30 *The syringe is placed carefully in its box* (Fig 47)

31 *The wire is inserted in the needle* (Fig 48)

32 *The needle is wrapped in cotton and placed in the box* (Fig 49)

33 *The alcohol in the dish is poured back into the bottle* since it can be used as long as it remains clear and

does not become discolored The neck of the alcohol bottle should be wide enough so that the alcohol may be poured back easily and not wasted (Fig 50)

34 *It is well to boil the syringe in water every week* In so doing the bottom of the pan should be covered with a cloth to prevent the syringe from hitting against the pan and breaking or the syringe may be placed in a strainer which has been set in water for this purpose In certain parts of the country the syringe may become coated from boiling in the hard water When only hard water is available these deposits can be prevented by the use of distilled water or by wrapping the syringe and the needle in cloth or gauze before boiling (Fig 51)

35 *Insulin should not be subjected to extremes of temperature and insulin bottles not in use should be stored in the refrigerator* The bottle of insulin that is being used can be kept at ordinary room temperature (Fig 52)

36 *The tray is left ready for the next injection* The dish of cotton is covered the bottle of alcohol closed the dish for the alcohol turned upside down on the tray, the insulin bottle placed in the box and the container for the syringe and the needle covered (Fig 53)

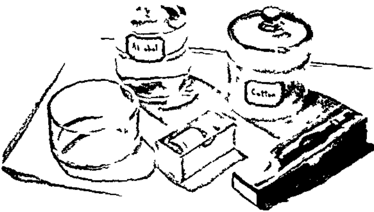


Fig 17 *A tray set up with the necessary equipment* should be kept in a handy place ready for use The tray and the various articles should be clean at all times The articles necessary for the injection of insulin are bottle of insulin bottle of alcohol dish to hold alcohol clean absorbent cotton in a covered container and the needle and the syringe in their box

Fig 18 *Cleanliness* is a rule of prime importance from the first to the last step of the procedure for the inject on of insul n and must not be overlooked In preparation the hands should be washed carefully w th mild soap and warm water and should be dried with a clean towel

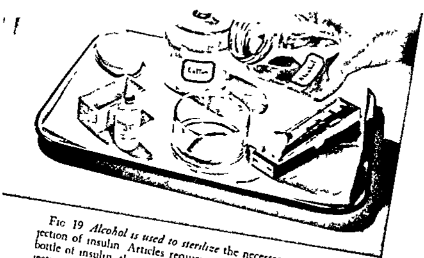


FIG 19 *Alcohol is used to sterilize* the necessary articles for the injection of insulin Articles requiring sterilization are the top of the bottle of insulin, the needle and the syringe The skin where the injection is to be made must also be sterilized with absorbent cotton dipped in alcohol The alcohol is poured into a clean dish for this purpose

FIG. 20 *It is necessary that the contents of the bottles of protamine zinc insulin, NPH insulin and lente insulin be well mixed before using* This is done by rolling the bottle between the palms of the hands but not shaking it, since by so doing the insulin would foam This procedure is not necessary for other kinds of insulin.

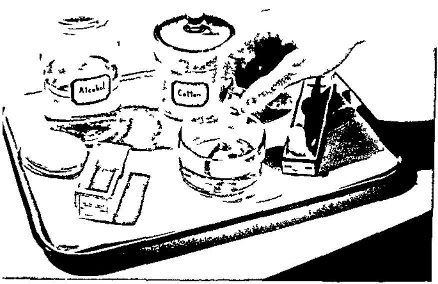


Fig 21 *The whole top of the bottle of insulin is sterilized* by dipping it in the dish of alcohol This must always be done before inserting the needle in the stopper *The rubber stopper in the insulin bottle never should be removed because it keeps the insulin sterile*

Fig 22 *It is well to keep a wire in the needle* to prevent it from becoming plugged The wire should always be removed from the needle before it is sterilized

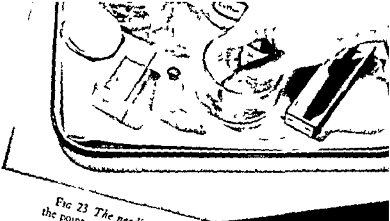


Fig 23 *The needle should be placed carefully in the alcohol* so that the point will not be blunted by hitting the dish Dull needles should not be used since they may injure the skin The needle should remain in the alcohol until ready to be placed on the syringe



FIG 25 *The syringe is put together* for the injection of insulin by inserting the plunger in the barrel The plunger (*glass rod*) *should fit* snugly into the barrel of the syringe so that there is *no leakage of in sulin*

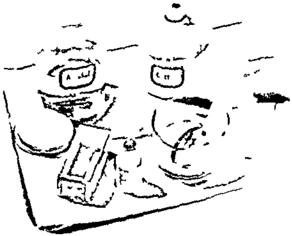


Fig 27 *The needle is placed firmly on the syringe* by twisting it to make it secure The needle is held by the hub to keep the point sterile since it should not be touched by the hands or come in contact with any object

Fig 28 *The syringe and the needle must be completely emptied of all alcohol* This is done by pulling the plunger up and down several times until the syringe and the needle are thoroughly dry



Fig. 29 *It is necessary to replace with the same amount of air the amount of insulin* to be withdrawn from the bottle. The syringe is filled with air by drawing the plunger as far as the figure that measures the amount of insulin that has been prescribed.

Fig. 30 *The air in the syringe is forced into the bottle* by inserting the needle through the center of the stopper of the insulin bottle. The syringe should be held near the needle and in a straight line with the insulin bottle so that the needle will not become bent as it is pushed through the stopper.



Fig 31 *Air is forced into the bottle* by pushing the plunger of the syringe as far as it will go When air is not forced into the insulin bottle to replace the insulin to be withdrawn from it a vacuum is created in the bottle A vacuum in the bottle makes it difficult to pull the plunger when measuring insulin because the plunger is sucked back as it is pulled

Fig 32 *The syringe is filled with insulin* by drawing the plunger as far as the figure that measures the amount of insulin prescribed One hand is used to hold both the insulin bottle and syringe allowing the other hand to be free to pull the plunger The bottle of insulin is turned upside down so that the insulin is immediately over the stopper To prevent bending the needle the insulin bottle and the syringe [illegible]

force the air back into the bottle of insulin and then pulled out again





FIG 33 *The needle is withdrawn from the bottle*

FIG 34 *The syringe, which is now filled with insulin, should be put down carefully* so that the needle on the syringe does not touch the hand or any object The cover of the syringe box with its cutouts is a good resting place for the syringe until the skin is sterilized for the injection of insulin



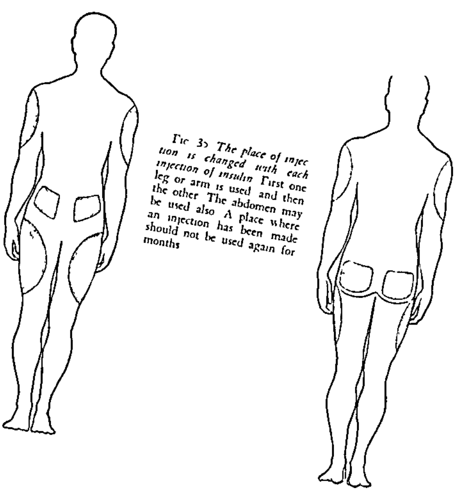


FIG 35 *The place of injection is changed with each injection of insulin First one leg or arm is used and then the other The abdomen may be used also A place where an injection has been made should not be used again for months*

FIG 36 *A small piece of absorbent cotton is dipped in the dish of alcohol*





Fig 37 *The skin is sterilized* at the place of injection by rubbing it gently with the cotton that has been soaked with alcohol

Fig 38 *The cotton may be placed back in the dish of alcohol or rested on the leg* where it is ready to use again after the insulin has been injected





FIG 39 *The left hand is used to pinch a large amount of flesh* the center of which is to be used for the injection With the flesh thus held firmly, the needle can be injected more easily

FIG 40 *The skin can be stretched* between the thumb and the first (index) finger when one is unable to pinch a large amount of flesh.



Fig 37 *The skin is sterilized* at the place of injection by rubbing it gently with the cotton that has been soaked with alcohol

Fig 38 *The cotton may be placed back in the dish of alcohol or rested on the leg* where it is ready to use again after the insulin has been injected

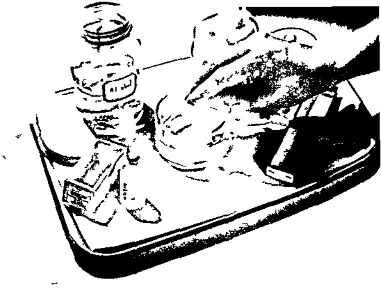




FIG 39 *The left hand is used to pinch a large amount of flesh* the center of which is to be used for the injection With the flesh thus held firmly the needle can be injected more easily

FIG 40 *The skin can be stretched* between the thumb and the first (index) finger when one is unable to pinch a large amount of flesh

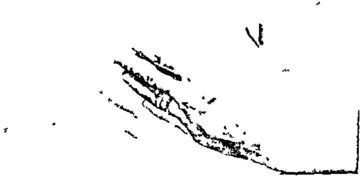


Fig 37 *The skin is sterilized* at the place of injection by rubbing it gently with the cotton that has been soaked with alcohol

Fig 38 *The cotton may be placed back in the dish of alcohol or rested on the leg* where it is ready to use again after the insulin has been injected

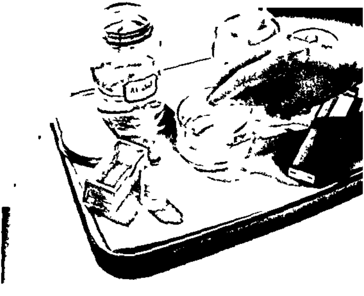


Fig 43 *The needle is withdrawn quickly with the right hand* At the same time the left hand with the cotton that has been dipped in alcohol, presses the cotton firmly over the place of injection so that the needle will not pull the skin as it is withdrawn

Fig 44 *The skin is sterilized* at the place of injection by rubbing it gently with the cotton that has been soaked with alcohol



Fig 41 *The needle is injected at a right angle (straight not slanted) to the leg* The syringe is held as one would hold a pencil, between the thumb and the index finger of the right hand, and the needle is pushed firmly for its entire length into the skin Once the needle is injected into the skin it is not necessary to hold the flesh With the left hand pull the plunger of the syringe back gently, and if blood is drawn into the syringe, withdraw the needle and insert it elsewhere

Fig 42 *The right hand is used to hold the syringe steady while the left hand holds the syringe at the top between the index and the middle fingers* and the thumb pushes the plunger to inject the insulin

Fig 43 *The needle is withdrawn quickly with the right hand* At the same time the left hand with the cotton that has been dipped in alcohol presses the cotton firmly over the place of injection so that the needle will not pull the skin as it is withdrawn

Fig 44 *The skin is sterilized* at the place of injection by rubbing it gently with the cotton that has been soaked with alcohol



Fig 45 *The needle is placed in the dish of alcohol* to keep it from becoming plugged The needle should be placed carefully in the alcohol so that the point will not be blunted by h tting the d sh

Fig 46 *The syringe is washed in alcohol* to prevent the plunger and the barrel from sticking This is accomplished by plac ng the end of the syringe in the dish of alcohol and drawing up the plunger to fill the syringe with alcohol and then pushing the plunger down to empty it

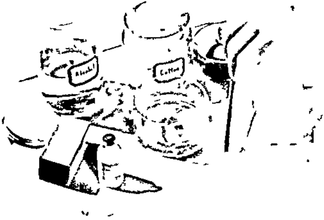


FIG 47 *The syringe is placed carefully in its box*

FIG 48 *The wire is inserted in the needle*

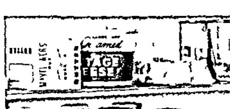


Fig. 49 *The needle is wrapped in cotton and placed in the box.*

Fig 50 *The alcohol in the dish is poured back into the bottle,* since it can be used as long as it remains clear and does not become discolored. The neck of the alcohol bottle should be wide enough so that the alcohol may be poured back easily and not be wasted

Fig 51 *It is well to boil the syringe in water every week* In so doing, the bottom of the pan should be covered with a cloth to prevent ... the pan and breaking or the syringe ... t in water for this pur ... ge may become coated ... its can be prevented by wrapping the syringe and the needle in ... or gauze before boiling

Fig 52 *Insulin should not be subjected to extremes of temperature and insulin bottles not in use should be stored in the refrigerator* The bottle of insulin that is being used can be kept at ordinary room temperature



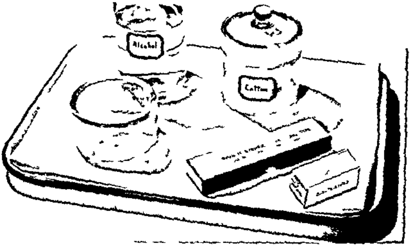


FIG 53 *The tray is left ready for the next injection* The dish of cotton is covered the bottle of alcohol closed the dish for the alcohol turned upside down on the tray the insulin bottle placed in the box and the container for the syringe and the needle covered

INJECTION OF INSULIN MIXTURES

Insulin mixtures are recommended in certain instances to meet individual needs more precisely These mixtures are always determined and prescribed by the physician

There are a few rules which apply in general to the use of insulin mixtures The strengths of the two insulin preparations should be the same both either U-40 or U 80 insulin When larger doses are required, the total volume should be reduced whenever possible by using U-80 strength (See Measurement and Strengths of Insulin Preparations, p 100)

Various combinations of insulins may be recommended Unmodified insulin may be mixed with one of the following preparations of modified insulin protamine zinc insulin, NPH insulin or lente insulin When any of these mixtures is used it is essential that unmodified insulin be drawn into the syringe first, *since the contents of the bottle of unmodified insulin should not be contaminated This could easily change the action of this insulin preparation*

When lente insulin is used in a mixture with either semilente or ultra lente insulin, there is no need for a special sequence in the preparation of the mixture, since these materials are all identical chemically

PROCEDURE FOR THE INJECTION OF INSULIN MIXTURES

The following procedure is employed for the injection of insulin mixtures The syringe, the needle and the two bottles of insulin are sterilized and prepared as described in Injection of Insulin (Figs 17 28)

1 *The amount of air equal to the prescribed amount of modified insulin is drawn into the syringe* (Fig 54)

2 *The air in the syringe is forced into the bottle of modified insulin* (Fig 55)

3 *The needle is withdrawn* (Fig 56)

4 *Then as described in Figures 29 33 the prescribed amount of unmodified insulin is drawn into the syringe and the needle is withdrawn from the bottle* (Fig 57)

5 *The bottle of modified insulin is tipped upside down* so that the insulin is next to the stopper, and the needle of the syringe, which already contains the unmodified insulin, is inserted in the bottle of modified insulin The plunger is allowed to rest against the hand so that it does not slip (Fig 58)

6 *The prescribed amount of modified insulin is drawn into the syringe* in addition to the unmodified insulin already in the syringe (Fig 59)

7 *The needle is withdrawn from the bottle of modified insulin* (Fig 60)

8 *The syringe containing the two insulins is held upright* the needle at the top and the plunger is pulled down slightly until a small air bubble can be seen (Fig 61)

9A, 9B *The syringe is held level and tilted slowly* from one end to the other In this way the air bubble rolls through the insulins and so they become mixed This is done until the insulins are well mixed (Fig 62)

10 *The air bubble is removed* from the syringe by again holding the syringe upright and pushing the plunger gently so that only the air bubble but no insulin is forced out (Fig 63)

11 *The syringe filled with the mixture of insulins is ready for injection* The method of injection is the same as that described in Injection of Insulin, Figures 34–44 (Fig 64)



Fig 54 *The amount of air equal to the prescribed amount of modi fied insulin is drawn into the syringe*

Fig 55 *The air in the syringe is forced into the bottle of mod fied insulin*





FIG 56 *The needle is withdrawn*

FIG 57 *Then* (as described in Figs 29 to 33) *the prescribed amount of unmodified insulin is drawn into the syringe and the needle is withdrawn from the bottle*



FIG 58 *The bottle of modified insulin is tipped upside down* so that the insulin is next to the stopper, and the needle of the syringe which already contains the unmodified insulin is inserted in the bottle of modified insulin The plunger is allowed to rest against the hand so that it does not slip

FIG 59 *The prescribed amount of modified insulin is drawn into the syringe* in addition to the unmodified insulin already in the syringe



FIG 60 *The needle is withdrawn from the bottle of modified insulin*

FIG 61 *The syringe containing the two insulins is held upright* the needle at the top and the plunger is pulled down slightly until a small air bubble can be seen



Fig 62 *The syringe is held level and tilted slowly* from one end to the other In this way the air bubble rolls through the insulins, and so they become mixed This is done until the insulins are well mixed

Fig 63 *The air bubble is removed* from the syringe by again holding the syringe upright and pushing the plunger gently so that only the air bubble, but no insulin is forced out

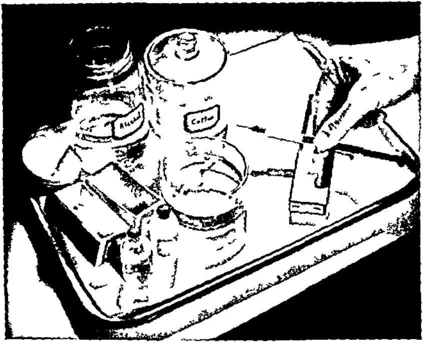


FIG 64 *The syringe filled with the mixture of insulin is ready for injection* The method of injection is the same as that described in Injection of Insulin (Figures 34 to 44)

INSULIN ALLERGY

Local reactions due to insulin allergy are encountered more often when *treatment is first begun* Usually, they are manifested by small to large red areas at the site of injection and may be associated with itching and pain These local reactions may appear soon after the insulin is injected or within a day or two, and they may persist for several days In unusual instances there may be local or generalized hives (urticaria)

Insulin allergy usually results from a sensitivity to the protein substances contained in the insulin When local reactions are mild, they frequently can be eliminated by one of several procedures Daily injections may be continued, using smaller amounts of insulin until the reactions gradually diminish and disappear Some local reactions may be eliminated by injecting the insulin deeper into the subcutaneous tissue Often, the use of another type or brand of insulin, or the use of 'special insulins obtained from either beef or pork pancreas will be helpful In the event that these procedures are not effective, it may be necessary to employ a desensitization method whereby frequent injections of dilute solutions are given, gradually increasing the amount of insulin until the prescribed dosage can be tolerated This should always be done under the supervision of the physician

There have been instances where the alcohol used for purposes of sterilization has been responsible for the inflammation at the site of the injection Under such circumstances some other means of sterilization should be employed

At times there may be a gradual disappearance of fatty tissue under the skin at the site of injection, causing a depression or 'dimpling The exact cause of this is not known Except for cosmetic reasons, there is no need for concern

4. INSULIN REACTIONS— DIABETIC ACIDOSIS AND COMA

INSULIN REACTIONS

(Hypoglycemia)

WHEN there is a correct balance between food and insulin, whether it is body insulin or body and bottle insulin, blood sugar levels are kept within limits of safety and comfort, and the urine usually contains little or no sugar (Fig 2) However, when insulin is taken in excess—which may happen for reasons given below—the balance between food and insulin becomes upset, and the blood sugar falls below the *normal* level (hypoglycemia) When this occurs, the terms "insulin reaction" or "insulin shock" are used to describe the series of events that may ensue Insulin reactions may occur shortly after the *injection* of insulin, or many hours later, depending upon the type of insulin used (p 97).

SIGNS AND SYMPTOMS OF INSULIN REACTIONS

Various signs and symptoms of an insulin reaction may affect the patient in one or more of the following ways The feeling of sudden hunger or weakness, nervousness, usually with perspiration and often with trembling Persistent headaches before meals, a feeling of drowsiness or nausea, or a sensation of numbness or tingling around the mouth or in the fingers The patient may laugh or cry, become anxious and confused, or become dizzy with blurred or double vision In some instances, patients have been known to become disoriented, lose the power of speech, get excited and to develop a staggering gait Unconsciousness may result when an insulin reaction is allowed to continue untreated (Table 14)

CAUSES OF INSULIN REACTIONS

As already explained, insulin reactions occur when, as a result of too much insulin for the amount of sugar in the body, the blood sugar falls below normal levels (Fig 2) An excessive amount of insulin may be taken as a result of incorrect measurement Often, reactions may occur during the early period of treatment when less insulin is required as the patient's carbohydrate tolerance improves The patient may have an insulin reaction when he is unable to, or does not, take his prescribed diet (*meals and intermediate feedings*), or when there is a loss of food due to vomiting or diarrhea Often, the blood sugar will fall to low levels when the intervals between meals are prolonged or when a meal or an intermediate feeding is omitted

Another consideration is the amount of exercise taken A moderate amount

of exercise is desirable, since it helps to burn sugar in the body, but when more exercise than planned for is taken, the blood sugar may fall to low levels Additional carbohydrate should be taken before an unusual amount of exercise, such as bowling, tennis, walking or dancing, to help prevent the possibility of an insulin reaction (See Exercise, p 180)

Caution should be taken to avoid an insulin reaction when driving a motor vehicle or when engaged in a hazardous occupation, particularly one that requires working with machinery or at a high elevation It may be well to have the diabetes so regulated that small amounts of sugar will be present in the urine at times to ensure against the occurrence of an insulin reaction

Treatment for an Insulin Reaction

Treatment for an insulin reaction consists in supplying the body with carbohydrate to counterbalance the fall in blood sugar A concentrated form of sugar is given This may be granulated or lump sugar, candy, jam or jelly, which will be absorbed rapidly by the body, thus raising the level of the blood sugar Fruit juices may also be used for this purpose Usually from *20 to 25 grams of carbohydrate are* required to overcome an insulin reaction, or the amount contained in 4 teaspoonfuls of granulated sugar, or 4 lumps of sugar, or in the juice of 2 oranges If the reaction continues, the same amount of carbohydrate should be repeated at intervals of 10 to 15 minutes

When unmodified insulin is used the reaction develops rapidly and usually can be overcome in a short period of time With the use of the slow and intermediate acting insulins a reaction develops more slowly, as a rule, and takes longer to overcome Therefore treatment for this type of reaction requires in addition to concentrated carbohydrate, other foods that are absorbed more slowly such as a glass of milk with a slice of bread or crackers or cereal instead of the slice of bread

It is advisable to remain quiet until an insulin reaction is over, so that the sugar that has been taken will be used not for body activity but for raising the level of the blood sugar

Responsible members of the family should know how to treat an insulin reaction for at times the patient may suffer confusion or unconsciousness When unconsciousness exists it is wise to call a physician at once so that he may inject sugar in the form of glucose into the vein Sugar should not be given in liquid form when the patient is unconscious, as it may cause choking Instead until the physician arrives sugar in dry form such as granulated sugar, may be placed under the tongue or inside the cheek, where it will be absorbed

Identification Card

An insulin reaction or acidosis (see following paragraph for acidosis) may result in mental confusion or, in extreme cases, unconsciousness or coma

The patient then would be unable to care for himself and would depend upon those near him for help There fore to ensure proper care at all times *an identification card** should be carried which contains the following particulars and request

- Statement of Disease—Diabetes
- Patient's name address and tele phone number
- Name address and telephone num ber of physician or institution treating patient
- Food prescription—carbohydrate protein and fat
- Insulin prescription — number of units and kind of insulin
- Request that sugar or candy be given immediately and that a physician be called if there is no improvement within 15 minutes

DIABETIC ACIDOSIS AND COMA

Acidosis, a serious consequence of uncontrolled diabetes results when sugar cannot be utilized and fat is called upon to supply the body's need for energy *Under these condi* tions there is a limit to the amount of fat the body can burn completely When this limit is reached certain substances, diacetic acid and acetone (ketone bodies) which are formed in the process of the burning of fat ac cumulate in the body more quickly than the body can rid itself of them This accumulation of diacetic acid and acetone in the body is called acidosis or ketosis

Causes of Acidosis

Acidosis may develop when insulin is omitted or when the diet is not fol lowed Acute infections such as pneu monia carbuncles severe infections of the extremities and intestinal disorders are the most common precipitators of acidosis When treatment is not given acidosis becomes severe and progresses *to diabetic coma Neglect of immediate* treatment for diabetic coma may re sult in death (Table 14)

Signs and Symptoms of Acidosis

Members of the family as well as the patient should be able to recognize *the signs and symptoms of acidosis* so that a physician may be summoned *as soon as this condition is suspected* When acidosis is present the patient appears to be ill and may become drowsy or very irritable One is thirsty as a rule with no appetite Vomiting may occur and cramps or pains in the abdomen the arms or the legs The skin is dry and cold to the touch and the face is flushed Vision is often dimmed or blurred and the eyeballs are soft There may be a sweet "fruity" odor from the breath The patient often complains of not having enough air ("air hunger") and breathes deeply *Urine tests show the presence of di* acetic acid and acetone in addition to large amounts of sugar (For direc tions for these tests see Chap 6) When acidosis is mild the patient is

*Identification cards may be obtained from physician or institution treating the patient

awake but may feel drowsy As the condition becomes more severe, and coma is approaching, the patient becomes more drowsy, and eventually unconscious (Table 14)

Care of the Patient with Acidosis

Acidosis, a forerunner of diabetic coma should be treated early and vigorously The services of a physician should be obtained as soon as possible Insulin is of prime importance in the treatment of acidosis and is always required for this condition

Constant attention should be given to the patient with acidosis until he is under the care of a physician Until medical care is obtained the following directions should be carried out

Fluid in the form of clear broth, tea or coffee should be taken frequently unless the patient is vomiting A specimen of urine should be obtained, if possible, so that it may be tested for sugar and acetone or diacetic acid (Chap 6) When there is fever, the patient should stay in bed and keep warm until the physician arrives It may be necessary to wrap him in blankets or to use heating pads or hot water bottles that have been covered to avoid body burns

Severe acidosis is best treated in the hospital Diabetic coma makes hospitalization mandatory

TABLE 14 COMPARISON OF CLINICAL FEATURES OF INSULIN REACTIONS AND DIABETIC COMA*

CLINICAL FEATURE	INSULIN REACTION	DIABETIC COMA
Onset	Sudden or gradual (minutes to hours)	Slow (days)
Causes	Delayed mealtime Omission of meal Excessive exercise Insulin overdosage	Neglect of treatment Intercurrent disease
Symptoms	Nervousness Weakness Sweating Hunger Blurred or double vision Abnormal behavior Unconsciousness Convulsions	Thirst Headache Nausea Vomiting Abdominal pain Dim vision Constipation Drowsiness Shortness of breath
Signs	Pallor Shallow respiration Sweating Pulse normal Eyeballs normal	Florid face Air hunger Loud, labored breathing Dry skin Rapid pulse Soft eyeballs Acetone breath Loss of consciousness
URINALYSIS		
Sugar	Usually absent, especially in second voided specimen	Positive
Acetone	Negative	Positive
Diacetic Acid	Negative	Positive
RESPONSE TO TREATMENT	Rapid occasionally delayed	Slow

* Adapted from Diabetes Mellitus Eli Lilly and Company

5. ORAL DRUGS

THROUGHOUT all the years since insulin was first discovered there has been a constant hope that one day there might be found a preparation for the treatment of diabetes which *could be taken orally and thereby* eliminate the necessity for hypodermic injections Now this hope has been realized for some patients

The story of oral drugs depicts another exciting series of events in the history of diabetes and its treatment. *Early in 1942* the therapeutic effects of a derivative of sulfanilamide, called 2254 RP, were being investigated in France by M Janbon and his associates at the Medical School of Montpellier It was found that this drug produced, in certain patients, symptoms and signs resembling hypoglycemia (low blood sugar levels)

Later, that same year, this information was presented to a French physiologist Auguste Loubatière, also in Montpellier, at the Institute of Biology He not only confirmed that hypo*glycemic effects were produced by* this drug but also noted that when the pancreata of the animals being studied were removed, the "sulfa" drug no longer produced a lowering of sugar levels in the blood As a result of further investigation it was concluded *that the presence of some insulin se*creting cells in the pancreas (beta cells in the islands of Langerhans) were essential for the successful action of the drug in regard to the lowering of the blood sugar.

Meanwhile, other investigators became interested in the 'sulfa' drugs, *and from the years 1947 to 1955 studies* were carried on in many countries In 1955 intensive clinical trials were begun on humans, not only in France, Germany, Denmark and Argentina but also in the United States and Canada as well The two "sulfa" drugs used *in these clinical trials were car*butamide (BZ55) and tolbutamide

These two "sulfa" drugs were found to be effective hypoglycemic agents in certain cases The first of these, carbutamide (BZ55), was withdrawn later because of untoward effects in *a small number of patients* Tolbutamide, on the other hand, became widely accepted and proved to be effective in the treatment of patients with stable, adult type diabetes Tolbutamide, first produced in Germany, is now available under different trade *names in many countries* In this country it is known as Orinase

ORINASE

Orinase* (Tolbutamide) first became available for general use in this

*Manufactured by the Upjohn Company, Kalamazoo, Mich

country in June, 1957, and today is the most widely used of all the oral hypoglycemic agents It is a crystalline chemical compound (a sulfonylurea) which is prepared in white tablet form Although chemically related to the so called sulfa" drugs commonly used in the treatment of certain infections, Orinase has no such antibacterial properties While the exact mechanism of its action is not yet clearly understood, it is believed that it stimulates the secretion of insulin by the pancreas and probably is concerned somehow with decreasing the release of sugar from the liver into the blood stream *The action of Orinase in lowering blood sugar levels is entirely different from that of insulin and therefore is never to be regarded as a substitute for insulin when treatment necessitates insulin therapy*

Orinase is generally used in the treatment of middle aged or elderly patients with stable, uncomplicated diabetes, commonly referred to as mild adult, maturity-onset diabetes This group would include patients in whom diabetes developed after the age of 30 As a rule, those patients who require less than 40 units of insulin daily are more apt to respond favorably to oral therapy in contrast with those needing larger doses

Generally, Orinase is not indicated for the treatment of juvenile-onset diabetes, unstable or so-called 'brittle" diabetes or for severe diabetes requiring large amounts of insulin for control Repeated episodes of diabetic acidosis or coma also preclude the use of this drug In addition, Orinase is not recommended when there is marked impairment of function of the liver, the kidneys or the thyroid gland Nor is it recommended when diabetes is disrupted by fever due to any cause infection, severe injury acidosis or coma or during surgery and other periods of stress *The use of Orinase is not indicated when adequate control of the diabetes can be achieved with dietary management alone*

Usually Orinase is prescribed in divided doses As a rule in the beginning, there is a trial period of 5 to 7 days during which time the patient s responsiveness to the drug is evaluated and the dosage determined Generally one is considered responsive to Orinase when one is symptom free, with little or no sugar in the urine and when the blood sugar levels are within reasonably normal limits During and immediately following this initial period of trial, frequent visits to the physician are necessary During this time the patient should keep in close touch with his physician and report any unusual symptoms or the presence of persistent sugar in the urine The presence of acetone in the urine should be reported immediately

In addition to instruction concerning the amount of Orinase to be used, the patient will need to know about the withdrawal of insulin Usually small doses of insulin are eliminated abruptly, while larger doses are withdrawn gradually The patient will also need to be informed about possible side-effects of the drug Hypoglycemia

usually mild in form and of short duration, occurs only occasionally This is more likely to happen during the transition period from insulin to Orinase therapy and can be treated with the immediate intake of quickly absorbed carbohydrate in the form of fruit juice, sugar, candy or soft drinks Other side effects may occur at times with the use of this drug, usually they are of an unimportant nature These are principally in the form of gastro intestinal disturbances such as nausea, epigastric fullness or heartburn Other side-effects may be manifested by allergic skin reactions such as itching, or a *rash or discoloration of the skin* Sometimes these side-effects can be lessened or eliminated by decreasing the dosage of Orinase However, there are instances where it becomes necessary to discontinue the drug and reinstate insulin therapy

There are other times when Orinase needs to be withdrawn temporarily or discontinued with reinstitution of insulin therapy This would be the case during the course of complications such as acidosis, surgery, infection, as well as severe diarrhea, nausea and vomiting Also, there are occasions when diabetes becomes uncontrolled for no apparent reason, and Orinase is no longer effective in controlling the diabetes This has been known to occur even after months of successful treatment with the drug and is referred to as a secondary failure Secondary failure can often be attributed to lack of adherence to the prescribed diet

It should be clearly understood that the use of Orinase or any other oral agent does not lessen in any way the *necessity for observing* every therapeutic measure concerned with the total treatment Good diabetic control always is dependent upon strict dietary adherence The rules regarding body weight, exercise, personal and mental hygiene and the avoidance of infection continue to require special attention on the part of the patient In addition, urine tests for sugar (p 148) *still need to be performed regularly* and, when indicated, the urine tests for acetone (p 148) One should be thoroughly familiar with the signs and symptoms of hypoglycemia Even *though these may* seldom occur, the patient must know how to recognize them and counteract them immediately with the intake of food

DIABINESE

Diabinese* (*Chlorpropamide*), another sulfonylurea compound, was the second oral hypoglycemic agent to become available for general use in this country It was discovered and *synthesized in* 1957 The indications for the use of this drug are much the same as have already been described for Orinase, since its mode of *action is indistinguishable* from that of Orinase However, Diabinese differs from Orinase in certain other respects

Diabinese has greater potency than

* Manufactured by the Pfizer Laboratories, Brooklyn N Y

Orinase, therefore it needs to be administered in smaller doses Since Diabinese is excreted slowly by the kidneys the full daily dosage is taken at one time This is in contrast with Orinase, which is excreted more rapidly and therefore is usually prescribed in divided doses

The side-effects of Diabinese are generally of a transient and insignificant nature Untoward reactions may include gastro intestinal and neurologic disturbances such as nausea vomiting epigastric discomfort, dizziness weakness or headache Often these are associated with higher dosages and at times can be alleviated by decreasing the dose of Diabinese If these side-effects persist when a minimal *effective amount is used usually* the drug is discontinued

One of the more serious side-effects encountered with the use of Diabinese is severe and prolonged hypoglycemia When this occurs in addition to foods containing readily available carbohydrate (p 138), it is necessary to take frequent feedings consisting of foods that will furnish sugar over a longer period of time Such foods would include bread crackers or cereal used with cheese or milk, or other similar combinations

Jaundice, a rare complication is associated occasionally with a skin rash occurring within 2 to 5 weeks of the initiation of therapy This reaction is typical of an idiosyncrasy and necessitates that the drug be discontinued immediately Effective therapeutic measures may need to be instituted As a rule this condition improves completely

During the initial control period with Diabinese therapy frequent visits to the physician are necessary After this time regular checkups are required at intervals determined by the patient s progress As with Orinase the use of Diabinese does not preclude careful attention to the prescribed diet as well as the other factors concerned with the total treatment of diabetes Furthermore when urine tests show persistent large amounts of sugar or when there are any unusual symptoms the physician should be notified without delay

The same standards of successful therapy described for Orinase also *apply to Diabinese (p 144)* The patient considered responsive to this drug is free of symptoms has little or no sugar present in the urine and has satisfactory levels of sugar in the blood Generally it has been found that patients who respond favorably to Orinase will also fare well on Diabinese therapy and vice versa However there have been occasions when there has been good response to one of the drugs when treatment has been unsuccessful with the other

DBI

DBI* (Phenformin), synthesized and developed in this country in 1958, is the newest of the oral hypoglycemic

*Manufactured by the U S Vitamin & Pharmaceutical Corporation New York.

agents to become available for general use DBI is completely unrelated to both Orinase and Diabinese not only in respect to its chemical structure but also in the mode of its action DBI is not an oral form of insulin; further, it does not stimulate the secretion of insulin in the body While DBI may be used in the treatment of patients with stable diabetes without the necessity of insulin therapy, it has been found most useful and effective when used in conjunction with insulin for the treatment of "brittle" diabetes of both the juvenile and the adult types

DBI is intended to help in the prevention of the wide fluctuations between hypoglycemic reactions and keto acidosis, thereby possibly eliminating these so-called "peaks" and "valleys' of blood sugar levels In many instances, these are side-effects with the use of this drug which preclude its use These are mainly gastro-intestinal in nature and are evidenced by loss of appetite, nausea or vomiting and in some cases diarrhea A frequent warning sign is an unpleasant, metallic or bitter taste in the mouth There may also be occasional lassitude or general weakness Although, at times, these side-effects can be prevented with a reduction of the dosage, often it becomes necessary to withdraw this drug entirely

Every precaution should be observed to avoid acidosis and coma or hypoglycemic reactions when DBI is used, especially during the initial period while the dosage is being adjusted Urine tests for sugar, and acetone tests when indicated, are especially important and need to be *performed* as prescribed

As with the other oral drugs their therapeutic success depends on strict adherence to the diet and all the other factors concerned with the total treatment of diabetes DBI, as with any medication, should never be used without medical supervision, which in this case, needs to be fairly constant for the proper evaluation of the effects of the drug

SUMMARY

Oral drugs are not indicated for patients who can achieve diabetic control with diet alone When diabetic control is not accomplished with the use of oral hypoglycemic agents, insulin is the only therapy, as there is still no substitute for it when needed The patient needs to be familiar with the technic for the injection of insulin so that diabetic treatment is maintained should oral therapy be interrupted or discontinued Even with the successful use of oral hypoglycemic agents, total diabetic treatment must be given adequate attention, prescribed diet must be followed, and the desired weight maintained Consideration is necessary for proper amounts of exercise, good mental and physical hygiene, and the other factors important in the total plan of treatment

Much has been learned about the oral hypoglycemic agents in a relatively short span of time Although the

exact mode of their action is not yet clearly understood, they have been proved to be both valuable and convenient agents in the treatment for many patients Of no little importance in the results of this discovery has been the stimulation that they have precipitated for further investigation into the entire subject of diabetes The patient has much to anticipate in the future as additional data is accumulated from research and experience

6. BLOOD AND URINE TESTS

THERE are certain blood and urine tests that determine the diagnosis of diabetes and guide the treatment The presence of sugar in the urine, regardless of the amount, usually denotes diabetes The diagnosis is confirmed when blood sugar levels are found to be elevated (Fig 2)

BLOOD TESTS

Often, a single blood sugar determination will furnish sufficient information for making a definite diagnosis of diabetes However, when a single blood test does not furnish necessary information, a further test—called a glucose tolerance test—usually is carried out The procedure for the glucose tolerance test is as follows The patient is given a specified amount of glucose (sugar), and then blood examinations are made at definite intervals over a period of 2 to 3 hours to determine blood sugar levels Urine tests are also taken at the same time

URINE TESTS

There are several tests for determining the presence of sugar in the urine The procedures for these are easy, but it should be remembered that tests must be done correctly, for no test is reliable if performed improperly Urine tests can and should be done by the patient according to the schedule set by the physician

Among the more popular urine tests for sugar are the Benedict's Test (p 150), the Clinitest (p 157) and Tes-Tape (p 163) The directions for these

ing his progress and also are a necessary guide in treatment The results of the tests which are reported to the physician will indicate the need for redistribution of food in the diet or for readjustment of the dosage of insulin or oral drug Often, when insulin therapy is used in treatment, the physician will prefer that there be small amounts of sugar in the urine, at times, to ensure against the occurrence of insulin reactions

The control of the diabetes often is disrupted during the course of certain complications, especially acute infections and gastro-intestinal upsets (vomiting and diarrhea) Therefore, when any of these conditions are present it is necessary to test the urine more frequently and report to the physician should the diabetes become uncontrolled

When diabetes continues to remain uncontrolled, as evidenced by the pres-

ence of large amounts of sugar in the urine, the test for acetone should be done (p 164 and p 170) Sometimes the test for diacetic acid is recommended in addition (p 171) One or both of these substances in the urine indicate acidosis (Chap 4), and the patient should notify his physician immediately

DIRECTIONS FOR COLLECTING A 24-HOUR SPECIMEN OF URINE

EQUIPMENT NEEDED Clean, tightly covered container sufficiently large to hold entire collection of urine Utensil for measuring the amount of urine collected Clean bottle, which contains 3 to 4 ounces, to be used for the sample of the 24 hour specimen of urine

COLLECTING THE SPECIMEN The collection of urine is started the day before the visit to the physician to allow 24 hours for the collection On that day the first specimen is not saved, as the collection of urine starts with the second passing of urine All urine passed during that day and night, and including the first specimen passed next morning comprises the 24 hour collection required After the total amount of urine has been measured (pints or quarts), a bottled 3 to 4-ounce sample of this collection of urine is taken to the physician for analysis The sample specimen should be labeled to indicate the patient s name and the total amount of the urine collected

BENEDICT'S TEST FOR SUGAR IN THE URINE

PREPARATION

1 * *A tray set up with the necessary equipment is a convenience to the patient* The articles necessary for the test for sugar in the urine are a metal or enamel household measuring cup, a container for collecting the specimen of urine Benedict's solution, † a test tube a medicine dropper, a teaspoon a small glass or cup to serve as a stand for the test tube, a test tube holder, or a paper napkin or paper towel folded for this purpose, and a clock (Fig 65)

PROCEDURE

2 *Measure 5 cubic centimeters of Benedict's solution* A teaspoonful measures this amount (Fig 66)

3 *Pour the contents of the teaspoon into the test tube* holding the tip of the teaspoon against the inside of the test tube (Fig 67)

4 *Fill the medicine dropper with urine* (Fig 68)

5 *Add 8 drops of the urine from the medicine dropper to the Benedict's solution in the test tube* (Fig 69)

6 *Mix the urine and the Benedict's solution by tipping the test tube 3 or 4 times* A finger is placed over the opening of the test tube so that the contents are not spilled (Fig 70)

7 *Place the test tube with its contents in a cup of bubbling, boiling water* Look at the time on the clock (Fig 71)

8 *Remove the test tube from the boiling water after 5 minutes* A holder should be used to remove the hot test tube from the cup to protect the fingers, and the test tube should be plac[ed] in the small glass (Fig 72)

9 *The color of the solution in th[e] test tube shows the amount of suga[r] in the urine* (Plate 6)

10 *Notice the color of the solution in the test tube* The color may be recorded with crayons on a special chart (Fig 73)

11 Wash the articles on the tray after completing the test so that they may be ready for the next test The stopper is placed back in the bottle of Benedict's solution The cup the container for urine and the small glass to hold the test tube are turned upside down on the tray (Fig 74)

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* The numbers refer to the pictures that follow

† Benedict's qualitative solution can be obtained at a drugstore It contains the following ingredients

Copper sulfate (pure crystallized)	17 3 Gr
Sodium or potassium citrate	173 0 Gr
Sodium carbonate crystallized	200 0 Gr
Distilled water to make	1000 0 Gr



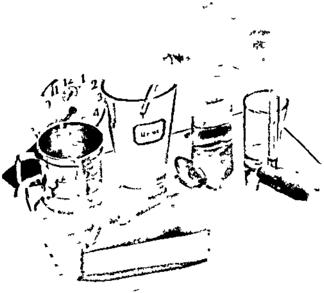
Fig 65 *A tray set up with the necessary equipment is a convenience to the patient* The articles necessary for the test for sugar in the urine are a metal or enamel household measuring cup a container for collecting the specimen of urine Benedict s solution a test tube a medicine dropper, a teaspoon a small glass or cup to serve as a stand for the test tube a test tube holder or a paper napkin or paper towel folded for this purpose and a clock

Fig 66 *Measure 5 cubic centimeters of Benedict s solution* A teaspoonful measures this amount



Fig 67 *Pour the contents of the teaspoon into the test tube,* holding the tip of the teaspoon against the inside of the test tube

Fig 68 *Fill the medicine dropper with urine.*



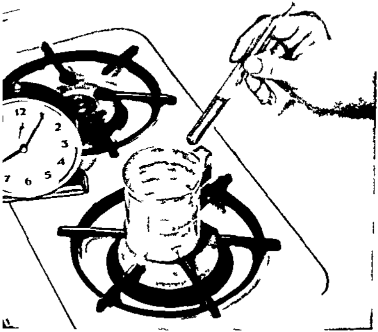
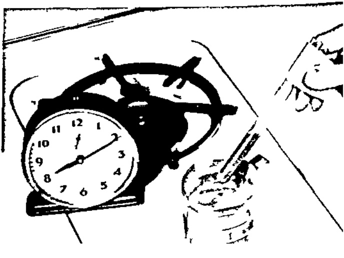


Fig 71 *Place the test tube with its contents in a cup of bub bling boiling water* Look at the time on the clock

Fig 72 *Remove the test tube from the boiling water after 5 m* A holder should be used to remove the hot test tube from the c protect the fingers and the test tube should be placed in the s glass



TEST FOR SUGAR IN THE URINE

CLINITEST*

(Urine Sugar Analysis Test)

PREPARATION

1 *A tray set up with the necessary equipment* is a convenience to the patient The articles necessary for the test for sugar in the urine are Clinitest Set, which contains Clinitest Tablets a test tube, a medicine dropper and a color scale showing the amounts of sugar in the urine, a container for collecting the specimen of urine and a container for water (a small glass or a paper cup may be used) (Fig 75)

PROCEDURE

2 *Open up Clinitest Set and place bottle of Clinitest Tablets on the tray* (Fig 76)

3 *Always make certain that the Clinitest Tablet has a spotted bluish white color* Never use a tablet that has turned dark blue or any other color than bluish white (Plate 7)

4 *Fill the medicine dropper with water* (Fig 77)

5 *Place 10 drops of water in the test tube* (Fig 78)

6 *Fill the medicine dropper with urine* (Fig 79)

7 *Add 5 drops of urine to the water in the test tube* (Fig 80)

8 *Remove 1 Clinitest Tablet from the bottle* (Fig 81)

9 *Return the bottle cap immediately* (Fig 82)

10 *Drop 1 Clinitest Tablet into the test tube containing the water and the urine* Watch but do not touch the test tube while the reaction is taking place (Fig 83)

11 *Wait for 15 seconds after the boiling inside the test tube has stopped then lift the test tube from its holder and shake it gently* (Fig 84)

12 *The color of the solution in the test tube shows the amount of sugar in the urine* Compare solution in test tube with color scale (Plate 8)

13 *Record with crayon the color of the solution in the test tube* Use the appropriate column of the Urine Analysis Record provided in the Clinitest Set or by your physician (Fig 85)

14 *Wash the test tube the medi... dropper and ... urine, ... the n...* ...ners for ... may b...

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* Ames Company Inc Elkhart Ind

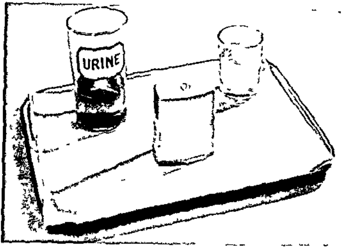


Fig 75 *A tray set up with the necessary equipment* is a convenience to the patient The articles necessary for the *test for sugar* in the urine are Clinitest Set, which contains Clinitest *Tablets, test tube, medicine dropper and color scale showing the* amounts of sugar in the urine, container for *collecting specimen* of urine and container for water (small glass or paper cup may be used)

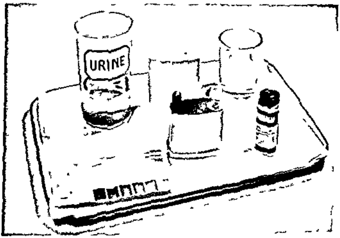


Fig 76 *Open up Clinitest Set and place bottle of Clinitest Tablets on the tray.*

Approximate Normal Appearance of a Clinitest Tablet



Plate 7. *Always make certain that the Clinitest Tablet has a spotted bluish white color* Never use a tablet that has turned dark blue or any other color than bluish white. (Ames Co., Elkhart, Ind)

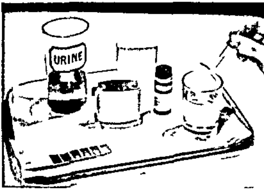


Fig 77 *Fill the medicine dropper with water*

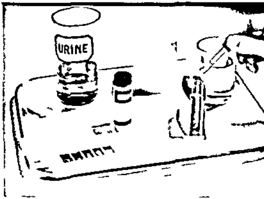


Fig 78 *Place 10 drops of water in the test tube*

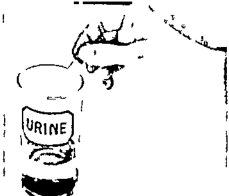


Fig 79 *Fill the medicine dropper with urine*

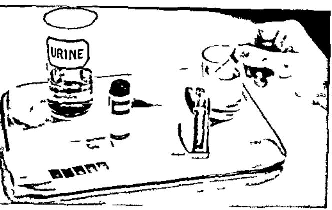


FIG 80 *Add 5 drop urine to the water in test tube*



FIG 81 *Remove 1 Clinitest Tablet from the bottle*

FIG 82 *Return the bottle cap immediately*

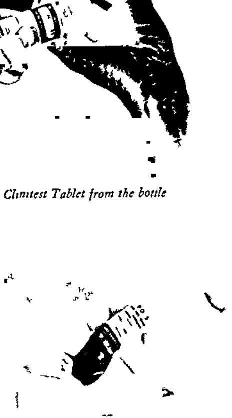


Fig 83 Drop 1 Clin test Tablet into the test tube containing the water and the urine Watch but do not touch the test tube while the reaction is taking place





Fig 84 *Wait for 15 second after the boiling inside the test tube has stopped then lift the test tube from its holder and shake it gently*

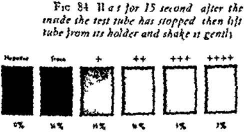


Plate 8 *The color of the solution in the test tube shows the amount of sugar in the urine* Compare solution in test tube with color scale (Ames Co Ukhart Ind)

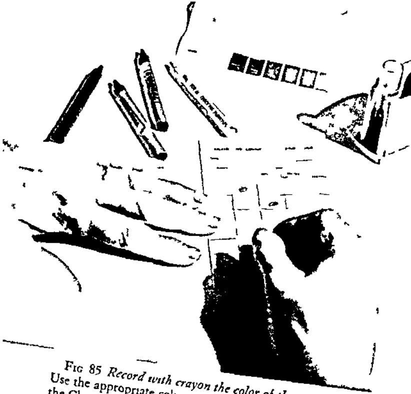
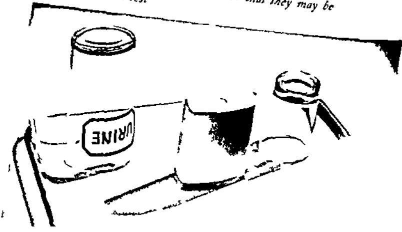


FIG 85 *Record with crayon the color of the solution in the test tube* Use the appropriate column of the Urine Analysis Record provided in the Clinitest Set or by your physician

FIG 86 *Wash the test tube the medicine dropper and the containers for water and urine so that they may be ready for the next test*

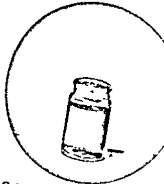


TEST FOR SUGAR IN THE URINE

TES-TAPE

(Urine Sugar Analysis Paper)

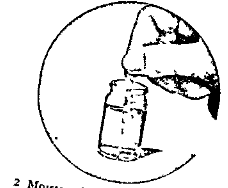
DIRECTIONS



1 Collect urine specimen

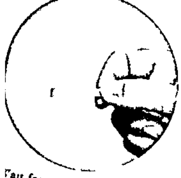
Special equipment is not required for the collection of urine Be careful to avoid use of a container contaminated with sugar (glucose)

Withdraw about 1 1/2 inches of Tes Tape by pulling down, and tear by pulling up against the cutting edge



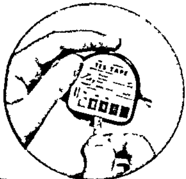
2 Moisten the strip of Tes Tape' with urine

The quantity of urine needed is very small Uniform moistening of strip will assure the most accurate indication Since the hands may carry traces of sugar the end of the tape held between the fingers should be kept dry



Wait for one minute

Calibrated color development in the moistened tape is accomplished in one minute During this time the tape should be held as pictured (Laying the tape on a dish paper or other surface may result in a false reading because of sugar contamination) *Yellow color indicates urine is sugar free*



4 Then *immediately* compare darkest area on tape with the color chart on the dispenser

If tape indicates 1/2 percent or higher, wait one additional minute and make final comparison When the Tes Tape strip is matched with the color chart, the reading indicates the amount of glucose either in percent or in relative figures (0 to ++++)

Plate 9

(Eli Lilly and Company)

LANGE'S TEST FOR ACETONE

PREPARATION

1 *The articles necessary for the test for acetone in the urine* are as follows a container for collecting specimen of urine, a small bottle of Lange s solution * 2 medicine droppers, a small bottle of strong ammonia, a teaspoon, a test tube and a clock (Fig 87)

PROCEDURE

2 *Measure 5 cubic centimeters (a teaspoonful) of urine* (Fig 88)

3 *Pour the teaspoonful of urine into the test tube* holding the tip of the tea spoon against the inside of the test tube (Fig 89)

4 *Fill one of the medicine droppers with Lange s solution* (Fig 90)

5 *Add 5 drops of Lange s solution to the urine in the test tube* and shake the test tube gently to mix the two solutions (Fig 91)

6 *Fill the other medicine dropper with ammonia* (Fig 92)

7 *Add from 10 to 15 drops of ammonia* to the solution being careful to tip the test tube so that when the ammonia is dropped against the side of the test tube it will run down slowly onto the surface of the solution (Fig 93)

8 *Hold the test tube upright again* (Fig 94)

9 *Acetone is present* when after a few minutes a reddish purple ring (Plate 10 *left*) forms between the layer of ammonia and the solution below When the color of the ring formed is brown or white no acetone is present (Plate 10, *right*) (Fig 95)

10 The color of the rings formed between the solution and the ammonia in the tube shows whether acetone is present or absent in the urine (Plate 10)

* Lange s solution is obtainable at a drugstore and contains 5 Gm of solution of sodium nitroprusside 5 cc of glacial acetic acid and 45 cc of distilled water

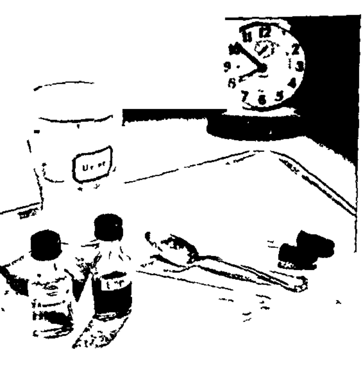


FIG 87 *The articles necessary for the test for acetone in the urine* are as follows a container for collecting specimen of urine a small bottle of Lange s solution 2 medicine droppers a small bottle of strong ammonia a tea spoon a test tube and a clock



FIG 88 *Measure 5 cubic centimeters (a teaspoonful) of urine*

FIG 89 *Pour the teaspoonful of urine into the test tube* holding the tip of the teaspoon against the inside of the test tube

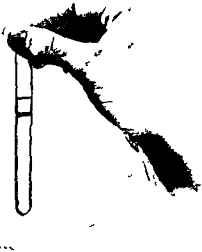
Fig 90 *Fill one of the medicine droppers with Lange's solution*

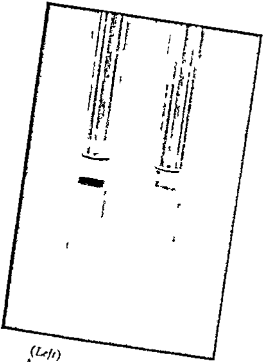
Fig 91 *Add 5 drops of Lange's solution to the urine in the test tube* and shake the test tube gently to mix the two solutions



FIG 94 *Hold the test tube upright again.*

FIG 95 *Acetone is present* when, after a few minutes, a reddish purple ring (Plate 10, *left*) forms between the layer of ammonia and the solution below When the color of the ring formed is brown or white no acetone is present (Plate 10, *right*)





(*Left*)
Acetone
present

(*Right*)
No acetone
present

PLATE 10 The color of the rings formed between the solution and the ammonia in the tube shows whether acetone is present or absent in the urine

URINE TEST FOR ACETONE
Acetest*

THREE SIMPLE STEPS FOR USE OF ACETEST

1. Place tablet on a clean surface, pref erably a piece of paper.



2. Put *one* drop of urine on tablet.



3 Take reading *at 30 seconds* Compare with color chart below

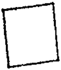


INTERPRETATION OF TEST

NEGATIVE: Tablet color will remain unchanged or turn cream-colored from wetting

POSITIVE: Within 30 seconds, color of tablet will change Depending on amount of Ketone bodies present, color varies from lavender to deep purple Results may be recorded as small, moderate or large amount

SMALL



* Ames Co, Inc

FERRIC-CHLORIDE TEST FOR DIACETIC ACID—GERHARDT'S TEST

PREPARATION

1 *The articles necessary for the test for diacetic acid in the urine* are as follows a container for collecting a specimen of urine, teaspoon, 2 test tubes, a medicine dropper, a metal or enamel household measuring cup, a small bottle of ferric chloride * a small glass or cup to serve as a holder for the test tubes, and a clock (Fig 96)

PROCEDURE

2 *Measure 5 cubic centimeters (a teaspoonful) of urine* (Fig 97)

3 *Pour the teaspoonful of urine into one of the test tubes,* holding the tip of the teaspoon against the inside of the test tube (Fig 98)

4 *Fill the medicine dropper with ferric chloride* (Fig 99)

5 *Add ferric chloride one drop at a time from the medicine dropper to the urine in the test tube* and watch for a change in color The solution may become cloudy, but upon the addition of more ferric chloride the cloudiness will disappear If the color of the solution in the test tube does not change (Plate 12a), no diacetic acid is present, and the following steps are not necessary (Fig 100)

6 *When the color of the solution changes* (Plate 12b) *and becomes darker (reddish brown) continue to drop ferric chloride into the solution only until there is no further change in the color* (Fig 101)

7 *Pour one half of the contents into the second test tube* since one half of the solution must be heated to prove whether or not diacetic acid is present (Fig 102)

8 *One test tube is placed in boiling water* (Fig 103)

9 *The test tube is removed after 2 or 3 minutes* (Fig 104)

10 *When the solutions in the 2 tubes are compared and that in the heated tube* (Plate 12c *is of a lighter color than that in the tube which has not been heated* (Plate 12b) *diacetic acid is shown to be present* The use of certain drugs such as aspirin will cause the solution to turn deep purple (Plate 12d) which will not become lighter when heated (Plate 12e) This is a drug reaction and does not indicate the presence of diacetic acid (Fig 105)

11 The color of solution in the test tubes show whether diacetic acid is present or absent in the urine (Plate 12)

* A 10 per-cent water solution of ferric chloride can be obtained at a drugstore



FIG 96 *The articles necessary for the test for diacetic acid in the urine* are as follows a container for collecting specimen of urine a teaspoon 2 test tubes a medicine dropper a metal or enamel household measuring cup a small bottle of ferric chloride a small glass or cup to serve as a holder for the test tubes and a clock

FIG 97 *Measure 5 cubic centimeters (a teaspoonful) of urine*





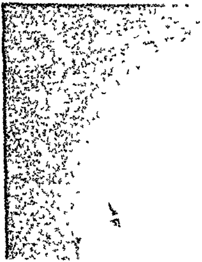




Fig 96 *The articles necessary for the test for diacetic acid in the urine* are as follows a container for collecting specimen of urine, a teaspoon 2 test tubes, a medicine dropper, a metal or enamel household measuring cup, a small bottle of ferric chloride, a small glass or cup to serve as a holder for the test tubes, and a clock

Fig 97 *Measure 5 cubic centimeters (a teaspoonful) of urine*



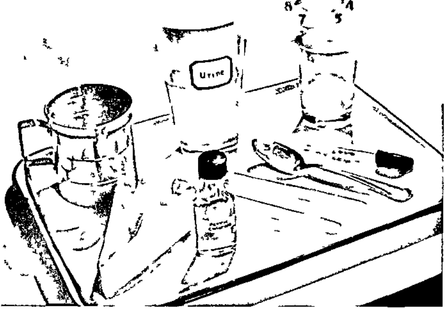


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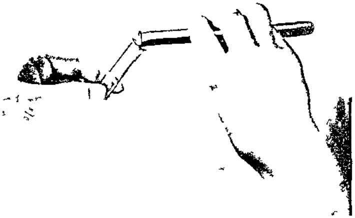


FIG 102 *Pour one half of the contents into the second test tube* since one half of the solution must be heated to prove whether or not diacetic acid is present

FIG 103 One test tube is placed in boiling water

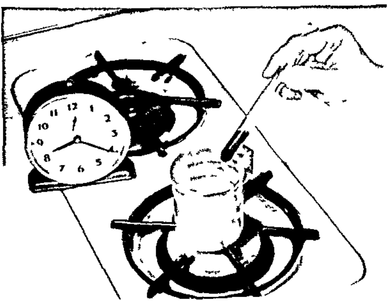
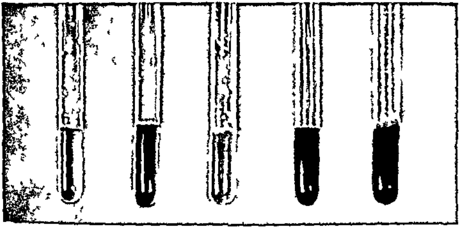


FIG 100 *Add ferric chloride one drop at a time from the medicine dropper to the urine in the test tube* and watch for a change in color The solution may become cloudy but upon the addition of more ferric chloride the cloudiness will disappear If the color of the solution in the test tube does not change (Plate 12a), no diacetic acid is present, and the following steps are not necessary

FIG 101 *When the color of the solution changes (Plate 12b) and becomes darker (reddish brown) continue to drop ferric chloride into the solution only until there is no further change in the color*



No diacetic acid present (A)	Diacetic acid present (before boiling) (B)	Diacetic acid present (after boiling) (C)	Drug reaction (before boiling) (D)	Drug reaction (after boiling) (E)

PLATE 12 The color of the solution in the test tubes shows whether diacetic acid is present or absent in the urine

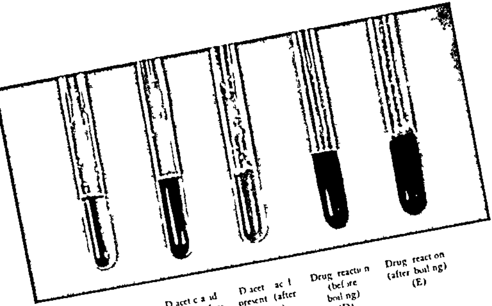


PLATE 12 The color of the solution in the test tubes shows whether diacetic acid is present or absent in the urine

Fig 105 *When the solutions in the 2 tubes are compared and that in the heated tube (Plate 12c) is of a lighter color than that in the tube which has not been heated (Plate 12b) diacetic acid is shown to be present* The use of certain drugs such as aspirin will cause the solution to turn deep purple (Plate 12d) which will not become lighter when heated (Plate 12e) This is a drug reaction and does not indicate the presence of diacetic acid

and disinfectants, many of which are irritating and injurious to the skin and should not be used unless the hands are protected. The hands should also be protected when any cleaning materials that might damage the skin are being used; for example, metallic sponges, scouring pads, or other types of abrasives may produce breaks in the skin and open a path for infection.

TREATMENT OF SKIN INJURIES

Prompt care of skin injuries, no matter how slight, is essential in preventing the development or the spread of infections and harm to the deeper tissues. A physician should treat severe injuries, as well as slight injuries that do not heal readily.

The simplest and safest way to treat slight injuries is to bathe the affected part with mild soap and warm water, wiping it with cotton that has been dipped in alcohol and then applying a sterile gauze pad or dressing.* Such dressings can be purchased in individual packages and always should be kept available. The hands should be washed before touching the sterile dressing and the surface of the dressing to be applied to the injured area should not be touched by the hands or any object. Bandages that are used to hold the dressing in place must be clean and should not be wrapped tightly, as they may interfere with circulation. Adhesive tape should be used sparingly, if at all, since it may irritate the skin or break it when the tape is being removed.

Only such antiseptics as have been prescribed by the physician should be used, since many common antiseptics may irritate, burn, or further injure the skin. Antiseptics that should *not* be used in ointment or liquid form include the following: iodine, carbolic acid or phenol, bichloride of mercury, oil of mustard, cantharidin, salicylic acid, and Capsicum. The names of these substances, which usually do not appear in the trade name of the product, are printed on the label where the contents or the ingredients are stated. The label on the container should be read carefully before any antiseptic is used.

With the advent in recent years of chemical agents and antibiotics, most infections can now be treated successfully, and surgery in the presence of infection no longer carries as great a risk. Many lives have been saved as a result of these newer therapeutic agents.

*Soaps containing antibacterial agents such as hexachlorophene may be used.

7. SKIN INJURIES AND INFECTIONS FROM SKIN INJURIES

DIABETES AND INFECTIONS

THE SKIN is a protective covering for the body, and while it remains unbroken infection from without will rarely occur Any injury to the skin, no matter how slight, should be given immediate care to guard against possible infections Infections are especially serious, as they often cause diabetes to become temporarily more severe Often, while infections last, the dosage of insulin has to be increased, and frequently during this time a patient who has been controlled on diet alone may require insulin When diabetes is uncontrolled it is believed that infections are more likely to develop, and when infections are present with uncontrolled diabetes there is great danger of acidosis

Any damage to the skin whether slight or severe must be considered as an injury Slight injuries are scratches, scrapes, small cuts, broken or cracked skin (fissures) and hangnails The more severe conditions are ulcers, boils (furuncles), carbuncles, abscesses, blisters deep cuts burns, sunburn and complications which result from over exposure to cold

PREVENTION OF SKIN INJURIES

Often skin injuries can be prevented Breaks or cracks in the skin may be the result of dry skin, in which case they can be prevented by applying lanolin to keep the skin soft and smooth However, when cracks or breaks in the skin occur between the toes, lanolin should not be used, as these commonly indicate a fungus infection (athlete's foot) and require medical care Blisters caused by friction can also be prevented by careful selection of shoes and stockings (Chap 8) Burns caused by overexposure to the sun or sun lamps are serious and should be prevented by gradual exposure There are special lotions for protection Precautions should also be taken when using baking lamps, heating pads and hot water bottles Injuries caused by frostbite or overexposure to cold carry great risk of serious damage to the skin and the underlying tissues and can be avoided by protecting the body with sufficiently warm clothing Hand injuries often result from the use of common household cleaning fluids, powders

and disinfectants, many of which are irritating and injurious to the skin and should not be used unless the hands are protected. The hands should also be protected when any cleaning materials that might damage the skin are being used, for example, metallic sponges, scouring pads or other types of abrasives may produce breaks in the skin and open a path for infection.

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8. PERSONAL HYGIENE, EXERCISE AND SPECIAL CARE OF CERTAIN PARTS OF THE BODY

PERSONAL HYGIENE

HYGIENE being the art of health preservation whether physical or mental, is advocated as a regular practice for everyone There can be no question that good habits or high hygienic standards are essential to the good health of all Hygiene assumes even greater importance when diabetes is present because its control depends to a great extent upon the establishment *of regularity in everyday activities* It is especially important that the person who takes insulin realize this and plan a daily routine which allows sufficient time for meals exercise, sleep, rest and recreation The patient with controlled diabetes usually can engage in most activities or occupations provided that a regular routine is followed and assuming that there is no other condition to warrant restrictions It is well to remember that worry and anxiety may have an unfavorable effect on the diabetes which is often evidenced by increased amounts of sugar in the blood and in the urine

Cleanliness of the body, and especially of the feet (p 182), the teeth, the hands and the nails, is important, not only for the prevention of infections (Chap 7) but also for desirable daily living conditions There should be sufficient conveniences in the home, the school the place of occupation and *the community to meet the needs for* good sanitation, as well as for the prevention of communicable diseases

Sleep and rest An adequate amount of sleep and rest is essential, since the strain of overfatigue may be upsetting Sleeping conditions should provide restful sleep—comfortable beds, proper temperature and ventilation Sleeping quarters should be so arranged that the patient who may wish to rest during *the day or to retire early can do so* without being disturbed Fatigue from overactivity or lack of proper rest may affect the appetite so unfavorably that the patient does not take the amount of food that has been prescribed

Bowel Elimination Good habits of bowel elimination depend not only on the kinds and the amounts of food and fluid that are taken in but also on the daily routine and the toilet facilities in the home, *the school or* the place of occupation It is essential to establish good habits of bowel elimination This means allowing sufficient time at a definite period in the day's routine

Exercise is an important component of diabetic treatment In addition to the promotion of physical fitness, exercise also enhances the utilization of sugar, often diminishes the required amount of insulin and is particularly

valuable in improving and stimulating the circulation in the body

Unless contraindicated for other physical reasons, a moderate amount of daily exercise is desirable The type, the amount and the frequency should be planned with the guidance of the physician Once decided, there should be concerted effort to follow the same regimen each day so that unnecessary fluctuations in blood sugar levels will be minimized or avoided Regular planned activity is especially important when treatment includes insulin therapy

There may be times when there are variations in the daily activity There are ways to compensate for these variations When more than the usual amount of exercise is planned, the diet may need to be increased Extra carbohydrate in the form of fruit or fruit juice often is recommended before short periods of exercise, while longer periods of exercise require, in addition to the fruit, other foods that contain all 3 food constituents—carbohydrate, protein and fat Foods such as milk, bread and butter or their food exchanges are recommended These will furnish additional sugar for energy requirements for a longer period of time Carbohydrate, which can be used by the body quickly and is readily available as a source of sugar should be kept handy in the event of an insulin reaction This could include such foods as sugar, candy, fruit, fruit juice or soft drinks (tonic or pop)

When the usual daily amount of physical activity is decreased, the diet frequently needs to be lessened When food adjustments are not effective for this purpose, there may be need for the adjustment of the insulin dosage This manipulation of insulin dosage is not usually recommended when dietary adjustment is effective and satisfactory

Many patients may find that urine sugar is increased during weekends even though the diabetes is well controlled during the weekdays This weekend situation can be remedied either by a small reduction in diet, an increase in activity, or by a slight increase in the dosage of insulin Any deviation from the prescribed treatment must not be attempted by the patient Adjustments are made by the physician

THE EYES

A yearly examination by an eye specialist is important, as changes in vision are often associated with diabetes There may be temporary variations in the acuity of vision which results from fluctuations or prolonged elevations of blood sugar levels This condition often occurs when treatment is first instituted or when the diabetes is uncontrolled and becomes stabilized when the diabetes becomes controlled It is usually advisable not to have glasses fitted or changed until good control is attained

More important and serious are the changes that may take place in the retina (the sensitive membrane of the eye) This condition, called retinitis,

often results in a diminution of vision in varying degrees and may be difficult to correct However, especially good and persistent control of the diabetes may help to allay the onset of this condition and to slow the progress Cataracts (opacities in the lens of the *eye) sometimes develop and may interfere* with vision However, when mature, these usually can be removed surgically to achieve restoration of vision

THE TEETH

Regular visits to the dentist are desirable to maintain good repair of the teeth When dentures are worn, the mouth should be examined at regular intervals to make certain that they fit properly and are not causing gum irritation Any tooth or gum infection requires immediate treatment The dentist should always be informed of the diabetic condition

When extractions are necessary it is well if possible, to choose a time when the diabetes is controlled The number of teeth to be extracted at one time should be decided by both the physician and the dentist

When the gums are sore or tender the food in the prescribed diet should be so prepared that chewing is made easy or even unnecessary Fruits and vegetables can be used in the form of juices or can be cooked and mashed, and meat and poultry can be ground The other foods in the diet usually do not require special preparation (p 82)

THE HAIR

A haircut, a shave or removal of hair in any way should be done with care to prevent skin infections caused by ingrowing hairs or the use of razors, scissors, clippers or other equipment that is not clean Ingrowing hairs often result from shaving too closely or from the use of depilatories (hair removers) The hair on the neck should be removed with a clipper or *scissors (not shaved), and depilatories* should be used with caution

THE HANDS

The hands come in contact with many objects and often are carriers of infection Mild soap and warm water should be used when washing the hands Care should be taken to *dry the hands thoroughly to* avoid chapping Fingernails should be kept at the proper length The cuticle may be pushed back gently with an orange wood stick but never with a pointed or sharp instrument Hangnails and injuries to the skin round the nails should be cared for at once (Chap 7) to prevent infection

THE FEET

The proper care of the feet is of extreme importance to prevent the development of serious conditions More than any other part of the body, the feet are affected by the condition of the

circulation. The blood flows through blood vessels which are shaped like tubes. The space inside the wall of the blood vessel is called the lumen. When circulation is good the blood vessel walls are soft and elastic, so that the blood flows through them with ease. However, as a person grows older certain changes take place in the blood vessels. The walls become thicker and harder, and the elasticity is lessened. The lumen, through which the blood flows, becomes narrower, which results in less blood flow (Fig. 106).

In the presence of impaired circulation one or more of the following conditions may occur. Often there is a burning feeling, or the feet may be cold, numb, or even painful at times. Walking may cause a tired feeling or cramps in the toes, the feet or the legs. Any unusual condition of the feet such as swelling, pain, soreness and changes in the color of the skin should be reported to the physician.

When there is evidence of impairment of circulation *the use of tobacco is usually prohibited. Rest periods are often recommended*, during which time the legs should be elevated. *Massaging the feet and the legs* may be helpful. This is done by spreading lanolin on the hands and kneading the flesh gently from the toes to the knees. *A warm bath may be beneficial* at any time. *Warm stockings and overshoes should be worn during cold weather. Woolen bedsocks may be used at night*, but hot water bags, electric heating pads or other heating appliances should be used only to warm the bed and should not be placed on the feet at any time, since they may cause a burn. *Crossing the knees or sitting on the legs interferes with circulation.* The legs should be crossed at the ankles only.

Any special treatment for impaired circulation is prescribed by the physician. *Contrast baths*, which are recommended occasionally, consist of placing the feet and the lower part of the legs immediately above the ankles first in warm water (105° F.) for 1 minute or longer, as directed, and then for the same length of time in cold water (50° F.). Always begin and end with warm water. It is wise to use a bath thermometer to obtain the correct tem-

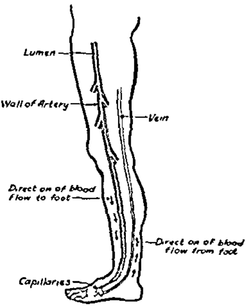


Fig. 106. Diagram of the circulation in the foot and the leg.

perature However, if a thermometer is not available, the water should be tested with the elbow or the wrist

The Buerger-Allen exercise is commonly used in an attempt to improve circulation Figures 107 to 112 will show the procedure for the various parts of this exercise The physician will recommend the number of times this exercise is to be repeated

BUERGER-ALLEN EXERCISE

The exercise, consisting of 3 parts, should be repeated as many times as the physician prescribes

Part I

Lie down on a bed or a couch and elevate both feet on a Buerger's Board (Fig. 107) from ½ to 3 minutes. A straight backed chair (Fig. 108) may be used instead to elevate the feet by resting the top of the back of it and the front of the seat on the bed or the couch. Place a soft covering or a pillow on the back of the chair or the board.

Figure 107



Figure 108



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FIGURE 107

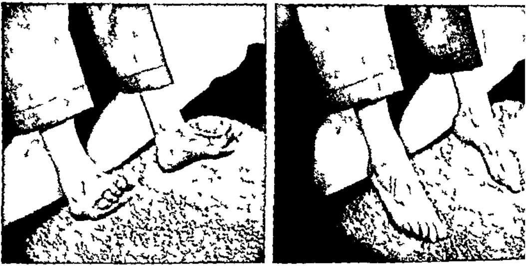


FIGURE 108



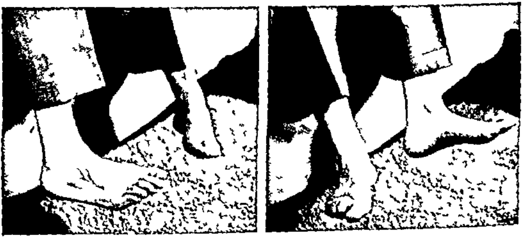
Part II

Sit on the edge of the bed or the couch with the legs spread out and relaxed the heels *resting on the floor Follow the different parts of this exercise for about* 3 minutes The feet should become pink to the tip of the toes If the feet become blue or painful lie down at once and elevate the feet until rested



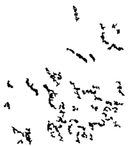
Up Down

Fig 109 Bend the feet up and then down as far as possible



Inward Outward

Fig 110 Turn the feet inward and then turn them outward



Toes Up



Toes Down

Fig 111 Bend the toes up and spread them then bend them do vn to close them

Part III

Lie do vn on the bed or the couch w h the legs ho zon al an l cover them Keep them varm S ay th s ay for abou 5 m nu es



Figure 112

SHOES AND STOCKINGS

Special care is necessary in the selection of shoes Each part of the shoe must be considered for the protection it gives to every part of the foot when at rest or used in standing walking, running or for other activities (Fig 113) The shoes should always allow the feet to rest in their natural position for freedom of movement, support of body weight and good posture (Fig 114)

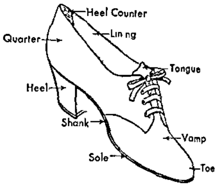


Fig 113 The parts of the shoe

Selection of Shoes

Size of shoes

Length Measure foot from the back of the heel to the tip of the big toe Shoe should extend ¾ of an inch beyond the big toe when standing The length from the back of the heel to the ball of the foot should also be known to ensure correct fit

Width Measure across the ball of the foot

Parts of the shoe (Fig 113)

Upper Part Of soft leather

Outer Line of Sole Should fit the natural curve of the outer side of the foot

Inside Line of Sole Straight, or nearly so, to allow room for the big toe to move forward when standing or walking

Toe Round and high with plenty of room for toes to move freely

Vamp Should support the foot, yet give it plenty of room

Sole Made of leather that can be bent easily Rubber may be placed on leather soles, but wooden soles should not be used

Tongue Should have no rough seams that might hurt the foot and should be wide enough to protect the feet from ridges caused by lacings and eyelets

Shank Stiff and as wide as the arch of the foot

Lining Smooth, with no wrinkles or rough edges that might irritate the foot

Heel Broad at the base Heels of women's shoes should be about 1¼ inches in height

Quarter Should fit the heel and the arch of the foot snugly so that the foot is kept in its natural position in the shoe

Heel Counter Firm, but soft enough



Fig 114 *The natural position of the foot in the shoe*

so that the foot will not be irritated

New shoes usually should be worn at first only for a short period of time. It is well to have an extra pair of shoes so that the same pair is not worn every day. Shoes should be kept in good repair, especially the heels, and old shoes that do not support the feet should not be worn. Shoe lacings should not be tied so tightly as to interfere with circulation. Eyelets should be smooth to avoid irritation. It is well to use a shoe horn so that the heel counter may be kept firm. House slippers should be chosen with the same care as shoes for the support and the protection of the feet. Bedroom slippers should be used only as a covering for bare feet when getting out of bed.

SELECTION OF STOCKINGS

Stockings

Size One half inch longer than the length of the foot

Dye Fast colors, so that feet are not stained

Seams Smooth, so that they do not cause irritation

Material Not bulky, so that space allowed for the feet is not lessened. Woolen stockings absorb moisture and should be worn when feet perspire freely. They also are desirable for keeping the feet warm.

When putting on stockings, they should be drawn carefully over the toes (Fig 115). The toe of the stocking should be pulled out before putting on the shoe to leave plenty of room for the toes (Fig 116). *Circular garters and rolled stockings can interfere with circulation and should not be worn.* New stockings should be washed before wearing. Stockings should be mended carefully so that there will be no rough places to cause irritation.



FIG 115 When putting on stockings they should be drawn carefully over the toes

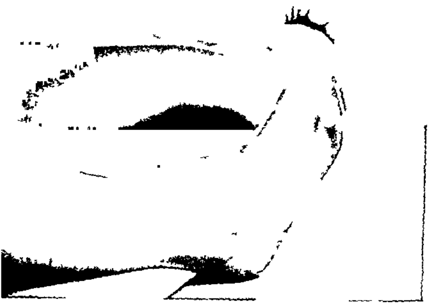


FIG 116 The toe of the stocking should be pulled out before putting on the shoe to leave plenty of room

BATHING THE FEET

Cleanliness of the body, and especially of the feet, is extremely important The feet should be washed every day The articles needed are a basin or a bathtub a soft cloth mild soap and warm (not hot) water (Fig 117) The feet should be washed gently, and care should be taken not to break the skin between the toes (Fig 118)

The feet should be dried with a smooth, soft towel (Fig 119) Special care is necessary when drying the skin between the toes The toes should be spread apart carefully, and the skin between them wiped gently until thoroughly dry Then dusting powder may be used, especially between the toes (Fig 120)

When the feet are dry and scaly they should be rubbed lightly with lanolin once a day but, to avoid collecting moisture, never between the toes (Fig 121) The feet should not be allowed to become tender with too frequent use of lanolin ***When the feet perspire freely and are moist*** they can be rubbed lightly with alcohol once or twice a day as necessary (Fig 122)

The care of the toenails is an important part of the care of the feet When the patient does not have good eyesight or steady hands someone else should care for his nails Always in good light the nails should be cut straight across and never cut shorter than the tips of the toes (Fig 123) Sharp corners should be rounded and the nails cleaned with an orangewood stick, the tip wrapped with absorbent cotton (Fig 124) In the same way,

lanolin can be applied to the nails that are brittle and break easily—on the cuticle and under the nail (Fig 125) Hangnails should be cut off as near the skin as possible

Corns and Calluses It is wise to have these treated by a chiropodist who has been informed of the presence of diabetes Corns and calluses are the result of thickening of the skin usually caused from the rubbing or pressure of shoes The patient should never cut corns and calluses for there is danger of injuring the skin and incurring infection However corns and calluses may be rubbed down carefully with a fine emery board after they have been well soaked Corn remedies and corn cures should not be used Corn pads should be used only on the advice of the physician or the chiropodist

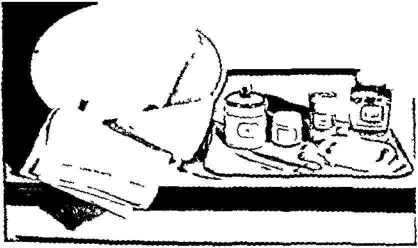


Fig 117 The articles needed for the care of the feet are a basin or a bathtub mild soap such as may be used for the face a soft washcloth and towel warm (not hot) water foot powder lanolin alcohol absorbent cotton an orangewood stick an emery board and a pair of scissors



FIG 118 The feet should be washed gently and care should be taken not to break the skin between the toes

FIG 119 The feet should be dried with a smooth soft towel Special care is necessary when drying the skin between the toes The toes should be spread apart carefully and the skin between them wiped gently until thoroughly dry





Fig 120 Dusting powder may be used, especially between the toes

Fig 121 When the feet are dry and scaly they should be rubbed lightly with lanolin once a day but to avoid collecting moisture, never between the toes. The feet should not be allowed to become tender with too frequent use of lanolin





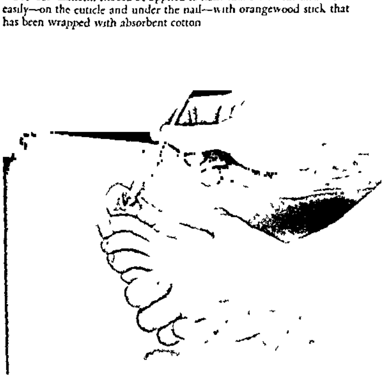
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Fig 123 The care of the toenails is an important part of the care of the feet. When the patient does not have good eyesight or steady hands someone else should care for his nails Always in good light nails should be cut straight across and never cut shorter than the tips of the toes Sharp corners should be rounded



Fig 124 Nails should be cleaned with an orangewood stick, the tip wrapped with absorbent cotton

Fig 125 Lanolin should be applied to nails that are brittle and break easily—on the cuticle and under the nail—with orangewood stick that has been wrapped with absorbent cotton



9. PERSONAL AND SOCIAL FACTORS

An Understanding of diabetes and its treatment is not complete without an awareness of the personal and social factors which are an integral part of successful treatment. Environmental circumstances create tensions and anxieties common to all whether they are related to family, friends or work associations. The more important factors include family traditions, recreation, the cost of medical care, marriage and pregnancy, and personal adjustments to environment.

NATIONALITY

Many persons will adhere to certain traditions of their own, originating primarily from their racial stock. These affect not only the choice and the preparation of food but also determine social practices and conventions. There is no need for these to be sacrificed when diabetes is present provided that there is a thorough understanding of the flexibility of the diet and the factors other than food that determine the success of treatment so that the necessary adaptations can be accomplished.

RECREATION

The value of relaxation associated with recreation has long been recognized for everyone. Recreation can and should be accomplished with determination. Actually, every attempt should be made to participate in the social activities as was the practice prior to the onset of the diabetes. By so doing there will be greater assurance of the continuation of a normal and enjoyable routine of living. However, one should remember that excessive fatigue can be upsetting and is to be avoided.

COST OF MEDICAL CARE

Medical care will subject the patient to extra expense, which will vary according to the type of treatment required and the frequency of visits to the physician. These expenses could be of concern, depending upon the individual's financial circumstances. There may be need for careful budgeting of other expenditures so there is no undue worry and strain resulting from the cost of medical care, medication and necessary equipment.

MARRIAGE

The successful marriage must necessarily be based upon sound and secure relationships. In married life, as in all family affairs, the individual is dependent upon those who surround him for complete family and social welfare. Therefore, when matrimony is contemplated the prospective mate

always should be informed of the diabetic condition In addition, it is most essential to provide an understanding of the disease and its treatment so that the adjustments which are indicated in the routine events of daily life can be prepared for

Then, too the considerations pertaining to childbearing should be discussed fully by the two parties concerned and the physician This matter cannot be discussed generally here, since each situation needs individual attention

PREGNANCY

Today, the chances for a successful pregnancy are more promising for the diabetic patient However, it should be realized that the possibilities of successful pregnancies with living babies are somewhat lessened when diabetes is present During pregnancy, there are changes in glandular secretions (hormones) with accompanying variations in the status of the diabetes These, when combined with variable amounts of physical activity, nausea or vomiting or emotional factors, often are the cause of fluctuations in blood sugar levels Any one of these conditions, alone or in combination can increase susceptibility to insulin reactions (hypoglycemia), or excessive amounts of sugar in the urine with or without accompanying acidosis

It is generally accepted that delivery for *diabetic mothers* is planned a short time before the normal date of expectancy and, also, that the progeny of diabetic mothers are usually delicate at the time of birth Therefore, close teamwork is essential between the physician, the obstetrician and the patient throughout the entire period of pregnancy, as well as directly following delivery No less attention needs to be given the newborn infant by the pediatrician

The careful and constant medical attention essential during pregnancy necessitates frequent visits to the physician so that the changes in the status of the diabetes can be evaluated and when indicated changes in treatment can be made Usually regardless of previous therapy for the regulation of the diabetes the patient will require either insulin or possibly an oral drug *in addition* to the prescribed diet The patient will need to perform regularly the urine tests for sugar (pp 148-165) and record the results for presentation to the physician on scheduled visits Urine tests for acetone (pp 164-170) will be necessary when unduly large amounts of sugar are present in the urine

Throughout the pregnancy there will be variations in the requirements of insulin or oral drugs, often to a great degree Careful adherence to the prescribed diet is extremely important The diet will need to be supplemented with a vitamin preparation to assure fulfillment of the increased nutritional requirement

Although the status of the diabetes changes during the course of the pregnancy, *the severity of the disease usually* remains unchanged following delivery Modern scientific knowledge concerning therapeutic measures en

compassing diligent diabetic control, careful prenatal and postnatal care, as well as the handling of the newborn infant, have been largely responsible for the present degree of success in this sphere of medicine Emphasis can not be stressed too heavily, nor too frequently regarding the need for the closest co-operation of patient and physician Co-operation here, as in so many other instances, can be most rewarding in its results.

HEREDITY

There is reliable scientific information, upon which most authorities agree, that a tendency toward diabetes may be inherited as a recessive characteristic according to the Mendelian Law of Heredity According to this theory, when only one parent has diabetes, the offsprings will seldom develop diabetes, but they will be potential carriers (having a history of diabetes in the family) When 2 hereditary carriers marry, 1 out of every 4 or 25 per cent of their children may develop the disease, and 3 out of every 4 or 75 per cent of their children will be carriers When a person with diabetes marries a hereditary carrier, one half or 50 per cent of the offsprings are expected to develop diabetes, and one half or 50 per cent will be carriers When 2 persons who have diabetes marry, all of their children are expected to develop diabetes

Under any of these circumstances, diabetes does not necessarily occur during childhood, or even adolescence, but may develop later in life (See Heredity and Expected Incidence of Diabetes, How the Mendelian Law of Heredity Applies to Parents and Their Children, page 5)

HUMAN RELATIONSHIPS

There is no greater influence upon an individual than that of his family, for relationships with the members affect the many necessary adjustments to daily routines Although self reliance is commendable and desirable, no one lives unto himself alone, and so the patient with diabetes must think of himself as part of his family and community as he participates in everyday activities Environmental factors are constantly providing circumstances to which all individuals need to adapt themselves continually As long as one has the capacity to adjust successfully to his environment, whether involved with family, friends or those at work or school, the chances of good mental and physical hygiene are enhanced

While it is true that a diabetic patient must consider his condition seriously, there is no reason to feel that the normal channels of life are denied him, for thousands of persons with diabetes are enjoying long, useful and happy lives The fact that there is treatment for the control of diabetes is the patient's inspiration *Knowing this, and with wholehearted and determined effort, successful treatment can be realized* And the information set forth in this book has been simply to provide you, the patient, with the accumulated experience for the care of your diabetes and consequently your total welfare

APPENDIX

TABLE 15 DESIRABLE WEIGHTS FOR MEN AND WOMEN OF AGES 25 AND OVER*
Weight in Pounds According to Frame (In Indoor Clothing)

Ft	In	Frame	Frame	Frame	Ft	In	Frame	Frame	Frame
5	2	112-120	118-129	126-141	4	10	92-98	96-107	104-119
5	3	115-123	121-133	129-144	4	11	94-101	98-110	106-122
5	4	118-126	124-136	132-148	5	0	96-104	101-113	109-125
5	5	121-129	127-139	135-152	5	1	99-107	104-116	112-128
5	6	124-133	130-143	138-156	5	2	102-110	107-119	115-131
5	7	128-137	134-147	142-161	5	3	105-113	110-122	118-134
5	8	132-141	138-152	147-166	5	4	108-116	113-126	121-138
5	9	136-145	142-156	151-170	5	5	111-119	116-130	125-142
5	10	140-150	146-160	155-174	5	6	114-123	120-135	129-146
5	11	144-154	150-165	159-179	5	7	118-127	124-139	133-150
6	0	148-158	154-170	164-184	5	8	122-131	128-143	137-154
6	1	152-162	158-175	168-189	5	9	126-135	132-147	141-158
6	2	156-167	162-180	173-194	5	10	130-140	136-151	145-163
6	3	160-171	167-185	178-199	5	11	134-144	140-155	149-168
6	4	164-175	172-190	182-204	6	0	138-148	144-159	153-173

For girls between 18 and 25, subtract 1 pound for each year under 25.

*Prepared by the Metropolitan Life Insurance Company, 1960. Derived primarily from data of the Build and Blood Pressure Study, 1959, Society of Actuaries.

HEIGHT AND WEIGHT TABLES FOR BOYS AND GIRLS

The height and weight tables presented on the following pages are intended to serve as a guide for determining and evaluating growth of boys and girls from 1 to 18 years of age. Since there is considerable variation in rates of growth the figures on the tables are given for the short, medium and tall individual in each age group. *The age and the height are the basis for obtaining the ideal or desirable weight.* For example, when the height occurs in the "short" column, the "short" column should also be used for finding desirable weight. Similarly, when the height appears in the "medium" or the "tall" column, the figure for desirable weight may be found in the "medium" or the "tall column" respectively. When the height falls between the figures listed in any two columns, then approximate weights may be estimated (Tables 16 and 17).

TABLE 16 HEIGHT AND WEIGHT TABLE FOR BOYS*

(1 to 18 years of age)

AGE YEARS	HEIGHT RANGE† INCHES‡ Short	Medium	Tall	WEIGHT RANGE ACCORDING TO HEIGHT† POUNDS‡ Short	Medium	Tall
1	29	30	31	20	22	26
2	33	35	36	25	28	32
3	36	38	40	29	32	37
4	39	41	43	32	37	42
5	41	43	46	36	42	48
6	44	46	49	41	48	57
7	46	49	52	46	54	65
8	49	51	54	51	60	73
9	51	53	56	56	66	81
10	52	55	58	61	72	90
11	54	57	60	66	78	99
12	56	59	62	72	85	110
13	58	61	65	77	93	123
14	60	64	68	87	108	137
15	62	66	70	100	120	148
16	64	68	71	111	130	157
17	65	69	72	118	136	165
18	66	69	72	120	139	169

* Adapted from Watson and Lowrey Growth and Development of Children ed 2 Chicago Year Book Pub 1954 Weight Percentile Table and adapted from anthropometric charts based on original data of H C Stuart and H V Meredith and prepared for use in Children s Medical Center Boston

† Height without shoes and weight without clothing except for light undergarments

‡ Figures rounded to the nearest whole number

Table 17 Height and Weight Table for Girls*

(1 to 18 years of age)

Age Years	Height Range† Inches‡ Short	Medium	Tall	Weight Range According to Height† Pounds‡ Short	Medium	Tall
1	28	29	30	18	21	25
2	32	34	36	24	27	32
3	36	38	40	28	32	38
4	39	41	43	31	36	44
5	41	43	46	36	41	49
6	44	46	48	40	47	54
7	46	48	51	45	52	61
8	48	51	53	49	58	70
9	50	52	55	53	64	79
10	52	55	58	57	70	90
11	54	57	61	63	79	101
12	56	60	63	70	88	112
13	59	62	65	80	99	125
14	60	63	66	91	109	133
15	61	64	66	98	114	138
16	62	64	67	101	117	141
17	62	64	67	103	119	143
18	62	64	67	104	120	145

* Adapted from Watson and Lowrey Growth and Development of Children ed 2 Chicago, Year Book Pub 1954 Weight *Percentile Table* and adapted *from* anthropometric charts based on original data of H C. Stuart and H V Meredith and prepared for use in Children's Medical Center Boston

† Height without shoes and weight without clothing except for light undergarments.

‡ Figures rounded to the nearest whole number

RECOMMENDED AMOUNTS OF THE FOOD CONSTITUENTS

Through study and research, scientists have been able to determine how much of the various food constituents the body requires. These amounts are measured in weights of the metric system* as *grams*, *milligrams*, *micrograms* and *kilograms*. The metric system is based on decimal measurements in 10's, 100's, 1,000's, 1,000,000's, similar to those used in our monetary system.

In this country pounds and ounces are used for weights. There are 16 ounces in a pound. When less than one ounce is used, it is called by a fraction of an ounce, such as ¼ of an ounce. The basic measure of weight in the *metric system* is the gram. There are about 30 grams in one ounce. One thousand grams (1,000 times a gram) equal one kilogram. One kilogram is equal to about 2.2 pounds. When the gram is divided by 1,000 (1/1000 of a gram), the result is a milligram (*milli* meaning 1/1000). Again, when the milligram is divided by 1,000 (or the gram is divided by 1,000,000) the result is a microgram (Table 18). The *microgram* is easy to remember because most people are familiar with the microscope, an optical instrument used to make tiny objects visible to the naked eye.

As has been stated, the normal daily needs of the body are based on the patient's ideal or desirable weight, measured in kilograms. The normal diet is figured by using certain amounts of each of the food constituents for every kilogram of ideal body weight. The amounts of the various food constituents recommended at the present time for calculating the normal diet for any person for one day are shown in Table 19.

* The metric system was devised many years ago during the French Revolution when a Commission of Scientists was appointed to simplify methods of weights and measures. This system is commonly used in all countries except the United States and Great Britain although scientists in these countries do employ it.

TABLE 18 MEASUREMENTS OF WEIGHTS OF THE METRIC SYSTEM

30 grams (about)	= 1 ounce
1 gram	= 1,000 milligrams
1 milligram	= 1,000 micrograms
1 gram	= 1,000 000 micrograms
1 kilogram	= 1,000 grams
1 kilogram	= 2 2 pounds

The kilogram can be used in weighing people

Example 154 pounds = 70 kilograms

132 pounds = 60 kilograms

Table 19 Recommended Daily Needs of the Body*

I ounce — 30 grams I n ll gra = 1/1 000 gran I m crogram = 1/1 000 m l gram
I k logram (kg) = 1 000 gran s (? ? lbs)

	Carbohydrate†	Protein	Fat†	Carbohydrate†	Protein	Fat†
	Grams per K logram of Ideal Body Weight			Total Grams F gured from Ideal We ght		
ADULTS Moderate Act ty						
Man (154 lb = 0 kg)	4– 6	1 1½	1 2	280–4 0	0–105	105–140
W on an (1?1 lbs 55 kg)	4– 6	1 1½	1 1½	? 0–330	55 83	55– 83
Pregnancy (last tr mester)	5 6	1 2	1 2	2 5–330	83–110	55–1 0
Lacta on	8	1 ?	1 ₂ 2	385–440	96–110	83–110
CHILDREN						
1 3 years (?7 ll s — 12 kg)	12 14	3 3½	3 –4	144–169	36– 4?	36– 49
4– 6 years (40 lb = 18 kg)	10–1?	2 3	2 3/	180–?16	45 54	45– 63
9 ears (59 lbs — ?7 kg)	8 10	2 ?	2 3	216–2 0	54– 68	54– 81
10–12 years (8 lbs = 35 kg)	7 9	2 2½	2 3	245–315	0– 88	0–105
GIRLS						
13–15 years (108 lbs — 49 kg)	5 7	1/ ?	1/2 2	245–343	4– 98	4– 98
16–20 years (120 lb = 54 kg)	5 7	1 1½	1 1½	? 0–3 8	54– 81	54– 81
BOYS						
13–15 years (108 lbs = 49 kg)	6– 8	1½ 2	2 3	294–39?	74– 98	98–147
16–20 years (139 lbs. = 63 kg)	6– 8	1 2	2 ?½	3 8 504	95 126	126–158

* Adap ed f om Recommended D eta y A owan es of the Food and Nu ion Board of he Na onal Resea h Counc l 1958

† The amoun of a bohyd a e and fat mu be adju ed to meet the ca o c need of he nd dual

CALORIES To c ma e he otal ca o es mu p y the g ams of ca bohyd a e and the g ams of p o e n by 4 and he grams of fa by 9 To al the re u t

TABLE 19 RECOMMENDED DAILY NEEDS OF THE BODY (*Continued*)

1 ounce = 30 grams 1 milligram = 1/1,000 gram 1 microgram = 1/1 000 milligram
1 kilogram (kg) = 1 000 grams (2 2 lbs)

	CALCIUM	IRON	VITAMIN A	THIAMINE	RIBOFLAVIN	NIACIN	ASCORBIC ACID	VITAMIN D
	Grams	Milligrams	International Units	Micrograms	Micrograms	Milligram Equivalents	Milligrams	International Units
ADULTS Moderate Activity								
Man (154 lbs = 70 kg)	0 8	10	5 000	1,500	1,800	20	75	
Woman (121 lbs = 55 kg)	0 8	12	5 000	1 100	1,500	17	70	
Pregnancy (last trimester)	1 5	15	6 000	1,300	2 000	20	100	400
Lactation	2 0	15	8 000	1 700	2,500	19	150	400
CHILDREN								
1– 3 years (27 lbs. = 12 kg)	1.0	7	2 000	700	1 000	8	35	400
4– 6 years (40 lbs = 18 kg)	1 0	8	2,500	900	1 300	11	50	400
7– 9 years (59 lbs = 27 kg)	1 0	10	3,500	1 100	1,500	14	60	400
10–12 years (78 lbs. = 35 kg)	1 2	12	4,500	1,300	1,800	17	75	400
GIRLS								
13–15 years (108 lbs. = 49 kg)	1.3	15	5 000	1,300	2 000	17	80	400
16–20 years (120 lbs = 54 kg)	1.3	15	5 000	1 200	1 900	16	80	400
BOYS								
13–15 years (108 lbs. = 49 kg)	1 4	15	5 000	1 600	2 100	21	90	400
16–20 years (139 lbs. = 63 kg)	1 4	15	5 000	1 800	2 500	25	100	400

Table 20 Food Values

This table lists the foods commonly used in the American dietary Not all of these foods are necessarily recommended for the diabetic diet, but they are included to serve as references and to indicate their values For practical purposes the figures for carbohydrate, protein and fat have been rounded to the nearest whole number The figures for calories listed in this table have been calculated by using the figures of 4 calories per gram of carbohydrate and protein, and 9 calories per gram of fat rather than the more nearly accurate method used in arriving at total caloric value as described in the U S Department of Agriculture Handbook No 8

Key to Symbols • signifies 0 5 gram or less, — signifies no value

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Household Measure	Grams	Foods	Carbohydrate	Pr		
Beverages						
1 teaspoon	2	Cocoa, dry	1			
1 cup	—	Coffee, clear	—	—		
2 rounded tablespoons	—	Postum, Instant, dry	9	—		
1 cup	—	Tea	—	—		
1 bottle 6 ounces	170	Water, carbonated	—	—		
Breads						
1 whole 3¼" diameter	65	Bagel	33			
1 small approximately 2" diameter	30	Biscuit baking powder	15			
1 slice ½" thick	32	Bread, Boston brown	15	1	1	73
1 slice	30	cracked wheat	15	2	1	77
1 cup	88	crumbs, dry, grated	64	11	4	336
1 slice	30	raisin	15	2	1	77
1 slice	30	rye American	1<	2	•	
1 slice, 4¾" x ½" x ⅜"	32	rye pumpernickel			•	
1 slice	30	white			•	
1 slice	30	whole wheat			1	

Household Measure	Grams	Foods	Grams Carbohydrate	Grams Protein	Grams Fat	Calories
1 whole, 4" diameter	39	Bulkie	33	5	2	170
1 piece 2" square	45	Corn bread	22	3	4	136
1 average	32	Doughnut	17	2	7	139
1 average		Muffin English	31	5	5	189
1 small	35	Muffin plain	15	3	4	108
1 average	27	Pancake	7	2	3	63
1 average	35	Roll clover leaf	21	3	3	123
1 3 1/4" diameter	44	Hamburg	24	4	2	130
1 average	34	Hot Dog	19	3	2	100
1 average	30	Parker House	14	2	2	87
1 average	35	whole wheat	18	3	2	102
1 piece	5	Toast, Melba	4	1	•	20
1 4 1/2" x 5 5/8" x 1/2"	75	Waffle	28	7	8	212
Cereal and Cereal Products						
2 tablespoons	25	Barley dry	20	2	•	88
1 cup scant	22	Cheerios	15	3	2	90
3/4 cup	18	Cornflakes	16	2	•	72
1/2 cup	120	Corn grits cooked	13	2	•	60
2 tablespoons	18	Cornmeal dry (1/2 cup cooked)	14	1	•	60
1 1/2 cups	21	Corn, popped	16	3	1	85
2 tablespoons	20	Cracker Meal	15	2	2	86
2/3 cup cooked	120	Cream of Wheat, 5 minute	14	2	•	64
3/4 cup cooked	174	Farina	16	2	•	72
1/4 cup	30	Grapenuts	24	3	•	103
3/4 cup	30	Flakes	23	3	•	104
1/2 cup cooked	120	Hominy	13	2	•	60
3/4 cup	19	Kix	15	2	•	68
3/4 cup	30	Krumbles	24	3	•	108
1/2 cup cooked	120	Maltex	16	2	•	72
1 average	23	Muffets	18	2	•	80
1/2 cup cooked	118	Oatmeal	13	3	1	73
1 cup	30	Pep	24	2	•	104
1/4 cup, cooked	—	Ralston	20	4	1	105
1/2 cup	30	Wheat Chex	23	3	•	104
1/2 cup	15	Rice Flakes	13	1	•	56
1/2	15	Krispies	13	1	•	56
1 cup	14	Puffed	12	1	•	57
1/2 cup cooked	84	White	22	2	1	105
1 tablespoon dry	7	precooked	6	1	•	28
1 tablespoon	10	Tapioca dry	8	•	•	32
2/3 cup cooked	—	Wheatena	22	3	1	109
1 cup	35	Wheaties	28	4	1	137

Table 20 Food Values (*Continued*)

Household Measure	Grams	Foods	Grams: Carbohydrate	Grams: Protein	Grams: Fat	Calories
1 cup	12	Wheat, Puffed	10	1	•	44
1 large	30	Shredded	23	3	1	113
1 small	22	Shredded	18	2	1	89
Crackers						
1	2	Animal	2	•	•	8
1	5	Arrowroot	4	•	1	24
1	4	Butter thin	3	•	1	21
1	4	Cheese Tid Bit	•	•	•	2
1	2	Corn Thins	1	•	•	9
2 tablespoons	10	Cracker Meal	15	2	2	86
1	4	Crax	2	•	1	17
1	7	Graham	5	•	•	20
1, 6" diameter	20	Matzoth	17	2	•	76
5 tablespoons	30	Matzoth Meal	26	•	•	104
1	11	Milk	8	1	2	54
1	8	Oyster	1	•	•	4
1	25	Pilot (Crown)	19	2	2	102
5 small sticks	5	Pretzel, thin sticks	4	•	•	16
1	4	Ritz	2	•	1	17
1	4	Ritz, Cheese	2	•	1	17
1, double square	7	Ry Krisp	4	1	•	20
1	4	Saltine	3	•	•	12
1	6	Soda	4	1	1	29
1	4	Triscuit	3	•	1	21
1	—	Venus Wafer	2	•	1	17
1	2	Wheat Thins	1	•	•	9
1	8	Zwieback	6	1	1	31
Dairy Products						
1 teaspoon	5	Butter	•	•	4	36
1 ounce	30	Cheese, American	1	7	9	113
1 ounce	30	Blue Mold	1	6	9	109
1 ounce	30	Camembert	1	5	7	87
1 ounce	30	Cheddar	1	7	9	113
1 ounce	30	Cheese foods, cheddar	2	6	7	95
1 ounce (2 tablespoons)	30	Cottage	1	6	•	28
1 ounce	30	Cream	1	3	11	115
1 ounce	30	Limburger	1	6	8	100
1 ounce (4 tablespoons)	30	Parmesan	1	10	7	107
1 ounce	30	Roquefort	1	6	9	109
1 ounce	30	Swiss	1	8	8	108
1 ounce	30	Swiss, processed	1	8	8	108
1 tablespoon	15	Cream, heavy	1	•	5	49
1 tablespoon	15	light, sweet or sour	1	•	3	31
1 heaping tablespoon	15	whipped, unsweetened	1	•	5	49

TABLE 20 FOOD VALUES (*Continued*)

HOUSEHOLD MEASURE	GRAMS	FOODS	GRAMS: Carbohydrate	Protein	Fat	CALORIES
1 tablespoon	7	Egg dried whole	—	3	3	39
1 medium	31	white	*	3	*	12
1 medium	54	whole	*	6	6	78
1 medium	17	Egg yolk	*	3	5	57
⅛ quart	100	Ice cream plain	21	4	13	217
1 cup, 8 ounces	244	Milk buttermilk	12	9	*	84
1 tablespoon	19	condensed	10	2	2	66
1 tablespoon	8	dried skim	4	3	*	28
1 tablespoon	8	dried whole	3	2	2	39
1 tablespoon	16	evaporated	2	1	1	21
1 cup 8 ounces	244	goat's	11	8	10	166
1 tablespoon	9	malted plain dry	6	1	1	37
1 cup 8 ounces	246	skim	13	9	*	88
2 tablespoons	30	whole cow's	2	1	1	21
1 cup 8 ounces	244	whole cow's	12	9	10	1[illegible]4
1 cup	240	yogurt* plain	15	11	8	1[illegible]6
Desserts						
1 average 3" diameter	25	Cookies assorted	19	2	3	111
1 serving 4 per pint of milk	157	Custard baked	23	9	9	209
1 tablespoon	10	Gelatin	—	9	—	36
⅛ quart	100	Ice cream plain	21	4	13	217
1 serving (5 servings to 1 package)	65	Jell-O plain	15	2	*	68
Fats						
1 teaspoon	5	Butter	*	*	4	36
1 tablespoon	15	French dressing commercial average	3	*	5	57
1 teaspoon	5	Margarine	*	*	4	36
1 tablespoon	13	Mayonnaise	*	*	10	90
1 teaspoon	5	Oil	*	*	5	45
1 tablespoon	16	Peanut butter	3	4	8	100
1 tablespoon	15	Salad dressing commercial average	2	*	6	62
Fish						
5-10	100	Clams	3	13	1	73
¼ cup	40	Crab	1	7	1	41
1 ounce	30	Fish (white) cod flounder haddock halibut, perch swordfish	*	5	1	29
1 ounce	30	Fish (dark) mackerel	1	6	3	55

*Figures obtained from H P Hood and Sons, Charlestown Massachusetts.

Household Measure	Grams	Foods	Grams: Carbohydrate	Grams: Protein	Grams: Fa
1 ounce	30	Herring, lake	—	5	2
1 ounce	30	smoked, kippered	—	6	4
1 (¾ pound)	334	Lobster, boiled	1	20	2
⅓ cup	50	canned	*	9	1
5–8 medium	100	Oysters	6	10	2
1 cup	240	Oysters	13	24	5
1 ounce	30	Salmon, canned, red	*	6	3
3 medium	*30*	*Sardines*	*	*7*	*3*
2 ounces (1–2 pieces)	60	Scallops	2	8	*
5 medium	30	Shrimp, canned	*	8	*
¼ cup	30	Tuna, canned, drained	*	8	2
Flour and Flour Products					
2 tablespoons	16	Cornstarch	14	—	—
1 tablespoon	7	Flour, white	5	1	*
½ cup, cooked	70	Macaroni	21	4	*
½ cup, cooked	80	Noodles, egg	10	2	1
½ cup, cooked	73	Spaghetti	22	4	*
Fruit					
1 small	100	Apple	15	*	*
½ cup	120	Applesauce, canned, unsweetened	13	*	*
2–3 medium	100	Apricots, fresh	13	1	*
4 halves	100	canned, waterpack	8	1	*
5 halves	19	dried, small	13	1	*
½ cup, scant	100	frozen	21	1	*
½ small	100	Avocado	5	2	26
1 small	100	Banana	23	1	*
1 cup, scant	100	Blackberries, fresh	13	1	1
½ cup	122	canned, waterpack	12	1	1
1 cup, scant	100	Blueberries, fresh	15	1	1
½ cup	121	canned, waterpack	11	1	1
½–⅝ cup	100	frozen, no sugar	15	1	1
½, 4½″ melon	150	Cantaloupe or muskmelon	7	1	*
20–25 small or 15 large	100	Cherries, raw, sweet	15	1	1
½ cup	100	canned, waterpack	13	1	*
1 cup	100	Cranberries, raw	11	*	1
1 rounded tablespoon	20	Cranberry sauce	10	—	*
¾ cup	100	Currants, raw, red	14	1	*
2 tablespoons	25	dried	18	1	*
3–4	30	Dates, dried or fresh	23	1	*
1 large	21	Figs, dried	14	1	*
1 small	38	fresh	7	1	*
½ small	100	Grapefruit, fresh	10	1	*

TABLE 20 FOOD VALUES (*Continued*)

Household Measure	Grams	Foods	Grams: Carbohydrate	Grams: Protein	Grams: Fat	Calories
¾	100	Grapes American varieties	15	1	1	73
[illegible]	66	green seedless	11	1	•	48
⅛ melon	100	Honeydew melon	9	1	•	40
1 medium	100	Lemon	5	1	•	24
cup	100	Loganberries	15	1	1	73
		Muskmelon see cantaloupe				
10 large	65	Olives green or ripe	2	1	7	75
1 small	100	Orange	11	1	•	48
1 medium	100	Peach fresh	12	1	•	52
2 halves	100	Peach canned waterpack	7	1	•	32
½ cup scant	100	frozen	20	•	•	80
1 large	182	Pear fresh	24	1	1	109
2 halves, medium	100	canned waterpack	8	•	•	32
[illegible]	100	Persimmons Japanese	20	1	•	84
1 slice ¾" thick 3½" diameter	84	Pineapple fresh	12	•	•	48
⅔ cup	120	frozen	25	1	•	104
medium	100	Plums	13	1	•	56
medium	50	Pomegranate	10	1	1	53
medium	16	Prunes dried raw	10	•	•	40
medium	33	cooked no sugar 2 teaspoons liquid	10	•	•	40
tablespoon	10	Raisins dried	7	•	•	28
½ cup	67	Raspberries black	10	1	1	53
cup	62	red	9	1	•	40
1 cup	122	Rhubarb raw cube	5	1	•	24
cup	112	Strawberries	9	1	•	40
3 large (about ¾ cup)	114	Tangerine	9	1	•	40
medium	345	Watermelon	11	1	•	48
1 slice (¾" x 10")	100	cubes or balls	7	1	•	32
cup						
Fruit Juices						
cup	120	Apple	17	•	—	68
cup scant	100	Apricot	10	1	•	44
cup	120	Grapefruit juice canned unsweetened	12	1	•	52
	120	frozen after diluting 1 3	13	1	•	56
¼ cup	60	Grape juice	12	•	—	48
cup	120	Lemon juice fresh	10	1	•	44
cup	120	canned unsweetened	10	1	•	44
cup	120	Orange juice fresh	14	1	•	60
cup	120	canned unsweetened	14	1	•	60
cup	120	frozen after diluting 1 3	12	1	•	52
cup	120	Orange grapefruit blend canned unsweetened	13	1	•	56
cup	120	frozen after diluting 1 3	13	1	•	56

Household Measure	Grams	Foods	Grams: Carbohydrate	Grams: Protein	Grams: Fat	Calories
½ cup	120	Pineapple juice, canned, unsweetened	16	*	*	64
½ cup	120	Prune juice, unsweetened	23	1	—	96
½ cup	120	Tangerine juice, canned, unsweetened	11	1	*	48
½ cup	120	Tomato juice, canned	5	1	*	24
Meat						
1 strip, 6″	7	Bacon, medium, cooked, drained	*	2	4	44
3 ounces	90	Beef, canned, corned, lean	—	23	7	155
1 ounce	30	chuck, pot roasted	—	8	7	95
¾ cup	180	hash	12	23	10	240
2 thin slices, 4″ x 5″	30	dried or chipped	—	10	2	58
3 ounces	90	hamburger, raw	—	14	25	281
1 ounce slice, 3″ x 2¼″ x ¼″	30	rib, roasted	—	7	7	91
4 ounces	120	steak, sirloin	—	28	32	400
1 slice, 4½″ diam x ⅛″	30	Bologna	1	4	5	65
1 average, 5½″	50	Frankfort, cooked	1	7	10	122
1 ounce slice, 4″ x 2½″ x ⅛″	30	Ham, fresh, cooked	—	7	10	118
1 rounded tablespoon	20	deviled	*	4	9	97
1 ounce slice, 4″ x 2½″ x ⅛″	30	smoked, cooked	*	7	10	118
⅓ heart	100	Heart, beef, raw	1	17	4	108
3 slices, 3″ x 2¼″ x ¼″	100	Kidney, beef, raw	1	15	8	136
1	35	Lamb, chop, rib, fried	—	8	11	131
1 oz slice, 3″ x 2¾″ x ⅛″	30	Lamb, leg, roasted	—	7	6	82
1 oz slice, 3″ x 2¾″ x ⅛″	30	shoulder, roasted	—	6	8	96
1 slice, approximately 1 ounce	37	Liver, beef, cooked	6	9	3	87
1 slice, approximately 1 ounce	36	calf, cooked	2	8	4	76
1 medium, 1 ounce	30	chicken, cooked	1	9	4	76
1 slice approximately 1 ounce	37	lamb, cooked	4	9	3	79
1 slice, approximately 1 ounce	37	pork, cooked	4	9	4	88
1 slice, 3″ diam x ¼″	30	Liverwurst	1	5	6	78
1 slice, 1 ounce	30	Luncheon meat	1	5	7	87
1 small	45	Pork, chop, loin, fried	—	10	12	148
1 ounce slice, 3″ x 2½″ x ¼″	30	loin,		7	8	100

Table 20 Food Values (*Continued*)

Household Measure	Grams	Foods	Grams: Carbohydrate	Grams: Protein	Grams: Fat	Calories
1 slice 4" x 2" x ⅜"	50	salt, raw, fat	—	4	85	781
1 slice approximately 1 ounce	40	shoulder, roasted	—	10	13	157
1 slice, 3¼" diam x ⅛"	30	Salami	—	7	11	[illegible]
1, 3" x ½"	20	Sausage, cooked	—	4	9	117
1 ounce	30	Tongue, canned, cooked	*	6	6	78
1 medium	85	Veal, chop, loin, fried	—	22	9	[illegible]
1 piece, 4" x 2½" x ½"	100	cutlet, raw	—	20	9	[illegible]
1 oz slice, 3" x 2" x ¼"	30	Veal, leg, roasted	—	8	4	68
1 oz slice, 3½" x 2" x ⅛"	30	shoulder, roasted	—	8	4	68
Miscellaneous						
1 cup	—	Beef, Chop Suey†	11	8	3	103
1 tablespoon	17	Catsup	4	*	*	[illegible]
1 cup	—	Chicken Chop Suey†	12	8	3	[illegible]
1 square	30	Chocolate, bitter	8	2	15	[illegible]
1 teaspoon	2	Cocoa, dry	1	*	1	[illegible]
½ cup	—	Cole Slaw	5	2	4	64
1 tablespoon	10	Gelatin, dry, plain	—	9	—	[illegible]
2 tablespoons	30	Gravy, with water	1	*	4	40
¾ cup (6 ounces)	180	Hash, corned beef, canned	12	24	10	[illegible]
1 tablespoon	15	Horseradish	—	—	—	—
1 cup	—	Macaroni and cheese, baked	43	18	24	[illegible]
1 teaspoon	5	Mustard, prepared, brown	*	*	*	4
10 large	65	Olive, green or ripe	2	1	7	[illegible]
1, 4" diameter	27	Pancake	7	2	3	[illegible]
1 large, 4" x 1¾" diam	135	Pickle, dill or sour	3	1	*	[illegible]
10 medium	20	Potato chips	10	1	7	[illegible]
½ cup	96	Sherbet	29	1	—	[illegible]
1 tablespoon	15	Vinegar	1	—	—	4
1 4½" x 5⅝" x ½"	75	Waffle	28	7	8	[illegible]
½ cup	133	White sauce, medium	11	5	[illegible]	[illegible]
1 cake	12	Yeast cake	2	1	*	12
1 tablespoon	8	Yeast, dried	3	3	*	24
Nuts						
12-15 nuts (shelled)	15	Almonds	3	3	8	96
2 medium (shelled)	15	Brazil nuts	2	2	10	[illegible]
8 medium	15	Cashew nuts	4	3	[illegible]	91
1 piece, 1" x 1" x ½"	15	Coconut, fresh	2	1	5	57
2 tablespoons, dried	15	shredded	8	1	6	90
12 medium	15	Filberts	3	2	9	[illegible]
1 tablespoon, scant	15	Peanut butter	3	4	[illegible]	[illegible]

† Proximate analyses, LaChoy Food Products Co., Archbold, Ohio.

Table 20 Food Values (*Continued*)

Household Measure	Grams	Foods	Grams: Carbohydrate	Grams: Protein	Grams: Fat	Calories
16-17 nuts	15	Peanuts	4	4	7	95
12 halves	15	Pecans	2	1	11	111
8-15 halves	15	Walnuts, English	2	2	10	106
Poultry						
1 ounce	30	Chicken, dark meat, raw	—	6	1	33
1 ounce	30	light meat, raw	—	6	•	24
1 ounce	30	Duck, raw	—	8	8	104
1 ounce	30	Turkey, dark meat, raw	—	7	3	55
1 ounce	30	light meat, raw	—	7	1	37
Soups Condensed Canned (before liquid has been added)						
½ cup (⅓ can)	100	Asparagus	8	2	1	49
½ cup (⅓ can)	100	Bean	18	6	4	132
½ cup (⅓ can)	100	Beef	9	7	2	82
½ cup (⅓ can)	100	Beef Noodle	7	3	2	58
½ cup (⅓ can)	100	Bouillon	3	4	—	28
½ cup (⅓ can)	100	Celery	8	1	3	63
½ cup (⅓ can)	100	Chicken, cream of	7	3	4	76
½ cup (⅓ can)	100	Chicken Gumbo	7	2	1	45
½ cup (⅓ can)	100	Chicken Noodle	7	3	1	49
½ cup (⅓ can)	100	Chicken with Rice	3	2	1	29
½ cup (⅓ can)	100	Clam Chowder (Manhattan Style)	9	2	2	62
½ cup (⅓ can)	100	Consomme	3	5	—	32
½ cup (⅓ can)	100	Minestrone	10	4	3	83
½ cup (⅓ can)	100	Mushroom, cream of	9	2	8	116
½ cup (⅓ can)	100	Onion	5	4	2	54
½ cup (⅓ can)	100	Pea, Green, Split	17	5	2	106
½ cup (⅓ can)	100	Scotch Broth	9	5	2	74
½ cup (⅓ can)	100	Tomato	12	2	2	74
½ cup (⅓ can)	100	Turkey with Noodles	8	3	2	62
½ cup (⅓ can)	100	Vegetable	10	3	1	61
½ cup (⅓ can)	100	Vegetable Beef	8	5	2	70
½ cup (⅓ can)	100	Vegetarian Vegetable	11	2	1	61
Condensed Canned Frozen (before liquid has been added)						
½ cup (⅓ can)	100	Clam Chowder (New England Style)	9	4	6	106
½ cup (⅓ can)	100	Pea, green pea with ham	15	7	2	106
½ cup (⅓ can)	100	Oyster Stew	7	5	6	102
½ cup (⅓ can)	100	Potato, Cream of	10	3	4	89
½ cup (⅓ can)	100	Shrimp, Cream of	7	4	11	143
½ cup (⅓ can)	100	Vegetable with Beef	7	5	2	66

Table 20 Food Values (*Continued*)

Household Measure	Grams	Foods	Grams: Carbohydrate	Grams: Protein	Grams: Fat	Calories
		Dried (after liquid has been added—reconstituted according to directions on package)				
1 cup	—	Chicken Noodle	9	2	1	53
1 cup	—	Beef Vegetable (with Noodle)	11	3	1	65
1 cup	—	Onion	6	1	1	37
1 cup	—	Tomato Vegetable	11	2	1	61
1 cup	—	Pea	11	4	1	69
		Vegetables				
1 large base	100	Artichokes French cooked, edible portion	12	3	•	60
4 small 1½" diam	100	Jerusalem raw	17	2	•	76
⅔ cup cut	116	Asparagus cooked	3	2	•	20
6 medium stalks	100	canned green	3	2	•	20
6 medium stalks	100	frozen or fresh	4	2	•	24
½ cup	128	Beans kidney cooked	21	7	1	128
½ cup	80	Lima green cooked or canned	15	4	•	76
½ cup	130	Navy or pea canned with pork	25	8	4	168
1 cup	125	snap green cooked or canned	6	2	•	32
1 cup	125	Beans snap yellow cooked or canned	6	2	•	32
½ cup	55	Bean sprouts mung cooked	3	2	•	20
½ cup diced	83	Beets, red cooked or canned	8	1	•	36
½ cup	73	Beet greens cooked or canned	4	2	•	24
⅔ cup	100	Broccoli raw or cooked	6	3	•	36
⅔ cup	100	frozen	4	3	•	28
9 medium	100	Brussels sprouts fresh or frozen cooked	9	4	1	61
1 cup shredded	50	Cabbage raw	3	1	•	16
½ cup	85	cooked	5	1	•	24
1 large	100	Carrot raw	9	1	•	40
1 cup diced	150	cooked or canned	10	1	•	44
½ cup	60	Cauliflower fresh or frozen cooked	3	1	•	16
1 cup diced	100	Celery raw	4	1	•	20
½ cup	75	Chard cooked	3	1	•	16
15–20 inner leaves	50	Chickory curly	—	—	—	—
2 tablespoons, dried	—	Chick peas or garbanzos	15	5	1	89
1 medium ear	100	Corn raw	21	4	1	109
½ cup	83	canned	17	2	1	85
3½ ounces	100	frozen	17	3	1	89

Table 20 Food Values (*Continued*)

Household Measure	Grams	Foods	Grams: Carbohydrate	Grams: Protein	Grams: Fat	Calories
½ cup, cooked	80	Cowpeas	13	6	1	85
½ medium	50	Cucumber	1	•	—	4
½ cup	90	Dandelion greens, cooked	8	2	1	49
2 slices	100	Eggplant, raw	6	1	•	28
20 long leaves	100	Endive, raw	4	2	1	24
2 large leaves	50	Escarole	2	1	•	12
½ cup	95	Lentils, dried, cooked	18	8	•	104
2 large leaves	50	Lettuce	1	1	•	8
½ cup	122	Mushrooms	5	3	•	32
2–3 small	100	Onions, cooked	9	1	•	40
½ cup	78	Parsnips, cooked	11	1	•	48
½ large	100	raw	18	2	1	89
½ cup	—	Peas, dried, split, cooked	19	7	•	104
¾ cup	100	Peas, green shelled, raw	18	7	•	100
½ cup	80	green, fresh or frozen, cooked	10	4	•	56
½ cup	80	green, canned	14	4	1	81
1 medium	65	Pepper, green, raw	4	1	•	20
1 small	100	Potato, sweet, cooked	28	2	1	133
1, 2½″ diameter	100	white, boiled	19	2	•	84
10 medium	20	chips	10	1	7	107
½ cup	114	Pumpkin, cooked	9	1	•	40
1 small	10	Radish	•	•	—	1
½ cup, cubed	80	Rutabagas, cooked	6	1	•	28
⅔ cup	100	Sauerkraut, canned	4	2	•	24
¼ cup	50	Soybeans, dried, whole	18	18	9	225
½ cup	100	Spinach, cooked or canned	4	3	1	37
½ cup	100	frozen or raw	3	2	•	20
½ cup	100	Squash, summer, cooked	4	1	•	16
½ cup	100	winter, cooked	9	2	•	44
1 small	100	Tomatoes, fresh	4	1	•	20
½ cup	100	canned or cooked	5	1	•	24
½ cup	120	Tomato juice	5	1	•	24
⅔ cup	120	Turnips, white, cooked	6	1	•	28
½ cup, scant	100	Vegetable juices, V-8 cocktail	4	1	•	20

TABLE 21 AMOUNTS OF CARBOHYDRATE, ALCOHOL AND CALORIES IN ALCOHOLIC BEVERAGES*

Alcoholic Beverage	Amount: Cubic Centimeters (cc.)	Amount: Household Measure	Grams: Alcohol†	Grams: Carbohydrate‡	Total Calories
Distilled Liquors					
Benedictine	20 cc	⅔ ounce	8	6	80
Brandy	20 cc.	⅔ ounce	8	—	56
Creme de Menthe	20 cc	⅔ ounce	8	6	80
Gin	30 cc	1 ounce	13	—	91
Rum	30 cc	1 ounce	14	—	98
Whiskey	30 cc.	1 ounce	15	—	105
Wines					
Champagne	120 cc	½ glass§	12	3	96
Port	30 cc	1 ounce	5	1	39
Red Wine (dry)	120 cc	½ glass§	16	—	112
Sherry	30 cc.	1 ounce	6	1	46
White Wine (dry)	120 cc	½ glass§	16	—	112
Malt Liquors					
Ale	240 cc	1 glass§	11	12	125
Beer	240 cc.	1 glass§	13	2	99
Cider					
Fermented	240 cc	1 glass§	12	1	88
Sweet	240 cc	1 glass§	2	12	62

* Adapted from Cooper, Barber, Mitchell and Rynbergen: Nutrition in Health and Disease. Philadelphia, Lippincott, 1958. Table on Alcoholic Beverages.

† Average figures were used when it was possible to obtain more than one analysis. Grams of alcohol are multiplied by 7 to obtain total calories.

‡ Average figures were used when it was possible to obtain more than one analysis. Grams of carbohydrate are multiplied by 4 to obtain total calories.

§ 8-ounce glass

DIET CALCULATION SHEET

This page has been provided for the calculation of the diet Space is allowed for adding the amounts of carbohydrate, protein and fat supplied by the foods eaten in one day The food values for carbohydrate, protein and fat are found in the exchange sheets When the total amounts of these have been figured, they can then be compared with the diet proscription

TABLE 22 DIET CALCULATION SHEET

Food	Amount	Grams: Carbohydrate	Grams: Protein	Grams: Fat
Milk whole				
Milk, skimmed				
Milk, evaporated				
Cheese, American				
Cheese, cottage				
Egg				
Meat				
Fish				
Poultry				
Butter				
Other fats or oils				
Fruit (1)				
(2)				
(3)				
(4)				
Vegetables Group A (1)				
(2)				
Group B (1)				
(2)				
Bread or Exchange (1)				
(2)				
(3)				
(4)				
(5)				
(6)				
Other Foods (1)				
(2)				
(3)				
(4)				
	Totals			
		× 4	× 4	× 9
	Calories			
	Total Calories			

fasting blood sugar The amount of sugar contained in the blood taken before breakfast when no food has been eaten after midnight

fat A food constituent which is found in fatty foods and provides the body with energy Each gram of fat supplies nine calories

globin (glo bin) insulin A clear amber solution of insulin which contains globin (a protein derived from hemoglobin) in addition to insulin

Glucose Tolerance Test (gloo kos tol er ans) A test to determine an individual s ability to use and store sugar It consists in giving the patient a certain amount of sugar and examining the blood and urine for sugar at definite intervals

glycogen (gli kö jen) A form of carbohydrate which is stored in the liver and reconverted into glucose as the body has need of it

gram *(gram) A weight of the metric system representing 1/30th of an ounce (30 grams = 1 ounce)*

hereditary (he red i ter i) Diabetic carrier A person who has a history of diabetes in the family

hypoglycemia (hi po gli se me-ah) A condition in which the amount of sugar in the blood is lower than normal

ideal weight The desired weight of an individual which is determined according to sex height and body build

insulin (in su lin) The active principle of the internal secretion of the Islets of Langerhans in the pancreas Insulin is necessary to enable the body to use and store sugar

iron A food constituent which is responsible for the color and condition of the blood It is found principally in eggs liver lean meat leafy and green vegetables

Islands of Langerhans *(lahn g-er hans) Small groups or clusters of cells within the tissue of the pancreas named for the German scientist Langerhans, who first called attention to these cells*

kilogram (kil o gram) A measurement of the metric system which equals 2 2 pounds

lente insulin (len te) A cloudy, milky appearing insulin containing insulin and zinc

meal plan The suggested arrangement of the diet into meals, usually with a specified time

Mendel s law (men delz) A law of inherited characteristics discovered by Gregor J Mendel an Austrian naturalist.

metric system (met rik) A decimal system of measures and weights with the meter and gram as bases One meter = 3 28 feet One kilogram = 2 2 pounds

micrograms (mi kro grams) A measurement of the metric system representing 1/1000th of a milligram (1 000 micrograms = 1 milligram)

milligram (mil'i gram) A measurement of the metric system representing 1/1000th of a gram (1 000 milligrams = 1 gram)

niacin (ni a sin) A food constituent (member of the vitamin B complex) which helps to keep nerves and body tissue healthy It is found principally in meat, poultry whole grain and enriched breads and cereals, and peanuts

obesity (o bes i ti) An excessive accumulation of fat in the body

oral hypoglycemic agents (hi po gli ce mic) Drugs which when taken by mouth lower blood sugar levels

Orinase (or in ace) (Tolbutamide) Brand name of an oral drug used in the treatment of diabetes

pancreas (pĭn' krē ăs) A gland in the upper abdomen which secretes digestive juices into the intestines which act upon carbohydrate, protein and fat. It also contains the islands of Langerhans which secrete the hormone insulin

polydipsia (pol-e-dip' se ah) Excessive thirst

polyphagia (pol-e fa' je ah) Excessive hunger

polyuria (pol-e u re-ah) The passing of an excessive quantity of urine

protamine zinc insulin (pro-tam'-in) A cloudy insulin which contains in addition to insulin zinc and a simple protein to lengthen the action of insulin in the body

protective diet A diet which contains proper amounts of carbohydrate protein fat, minerals and vitamins

protein (pro' te in) A food constituent essential to growth building of muscle and repair of tissue It is found principally in animal foods such as dairy products meat and fish and vegetables such as peas and beans, and nuts

protein complete Protein containing essential amino acids found usually in animal sources such as milk, cheese, eggs and meat

protein, incomplete Protein which does not contain all of the essential amino acids and is found usually in vegetables, grains and nuts

reaction insulin (re ăk'-shŭn) A condition which results when the blood sugar level falls to lower than normal levels due to too much insulin or too little food

recommended daily needs The amounts of the various food constituents suggested by the National Research Council as being necessary for the maintenance of good health

riboflavin (rī'bō fla-vĭn) A food constituent (member of the vitamin B complex) which is necessary for growth, for eyesight, healthy skin and is concerned in the burning of carbohydrate It is found principally in dairy products, meat and green leafy vegetables

saccharine (sik ah rin) A coal tar crystalline product several times sweeter than sugar but having no food value

sodium chloride Table salt

thiamine (thi a mīn) A food constituent (member of the vitamin B complex) necessary to maintain and stimulate the appetite, aid bowel movement keep nerves and muscles healthy, and helps in the burning of carbohydrate It is found principally in whole grain and enriched breads and cereals, meat and vegetables

twenty four hour urine specimen Sample from the total amount of urine passed in a 24 hour period

unrestricted foods Foods which contain no appreciable amounts of carbohydrate protein, and fat and may be used freely in a diabetic diet unless restricted by the presence of conditions other than diabetes

urinalysis (u ri năl' i sis) Chemical analysis of the urine

PERSONAL INFORMATION

NAME OF PATIENT______________________________

Address______________________________

Telephone Number______________________________

NAME OF PHYSICIAN HOSPITAL OR CLINIC____________________

Address______________________________

Telephone Number______________________________

DIET PRESCRIPTION

Carbohydrate________________grams

Protein________________grams

Fat________________grams

Calories________________

INSULIN PRESCRIPTION

Kind________________Number of Units__________

Kind________________Number of Units__________

OTHER MEDICATION

AFFILIATES
of the American Diabetes Association

At the present time the American Diabetes Association has 44 Affiliate Associations, many of which have active lay groups, and others are in the process of formation. Information about Affiliates in a specific area may be secured from the American Diabetes Association, 1 East 45th Street, New York 17, New York.

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